Space InfraRed Telescope Facility

(SIRTF)

See SPOT Run

The SPOT User's Guide
SIRTF Planning Observations Tool v3.5

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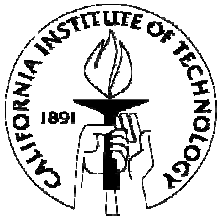

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1 Introduction

Welcome to SPOT – the SIRTF Planning Observations Tool. Version 3.5 is the first release of the software to the astronomical community. The SPOT software is available to download from the Proposal Kit page at the SIRTF Science Center SSC web site (http://sirtf.caltech.edu).

The process of planning a SIRTF observation with SPOT consists of entering targets which are individually linked to a desired SIRTF observing mode via an Astronomical Observation Template (AOT). The instrument parameters that completely specify the observation are entered via the AOT. The complete target + instrument information results in an Astronomical Observation Request (AOR), the primary unit of SIRTF observing. SPOT allows you to determine how much time will be required to execute the observation by obtaining an estimate from the AIRE (AOR Interpreter and Resource Estimator) server software at the SSC. This is the amount of time you must request for this AOR in your observing proposal.

This User's Guide provides information about how the SPOT software works. The release notes that are packaged with the software provide additional information about computer platforms supported for this version, performance issues, and a list of known bugs. A list of bugs/issues is updated regularly on the Proposal Kit web page.

To make using SPOT and planning your SIRTF observations easier we recommend:

1. *Read the relevant sections of the SIRTF Observer's Manual to decide how best to implement your observations.*
2. *Read the release notes that are packaged with the software. Some, but not all, of that information is repeated here.*
3. *Check the Proposal Kit web page for additional information in helping you plan your observations.*
4. *Save your AORs often. SPOT does not save your work to disk automatically. Given the variety of operating systems we support, we cannot guarantee that it won't crash. Saving your work often will make these events, though rare, much less painful.*

Please email us at the SIRTF Help Desk at sirtf@ipac.caltech.edu with any questions or comments.

2 Minimum Recommended Hardware Configuration

SPOT is written in the JAVA language and therefore requires lots of memory and a fast processor in your computer. The minimum recommended hardware configurations are:

2.1 Sun WORKSTATIONS: Sun Ultra 1 with 64 MB RAM

128 MB of RAM is optimal. The software may perform acceptably with a Sparc 20 with 64 MB RAM. SPOT will not run acceptably on Sparc 1, 2, 5, or 10 workstations.

2.2 Windows PC: Pentium 2 processor with 64 MB RAM

128 MB of RAM is optimal. The software has been tested on a Windows 95 laptop with a Pentium processor and 64 MB of RAM and does run acceptably, although it is slow.

2.3 Linux PC: Pentium 2 processor with 64 MB RAM

We have done limited testing on a Linux system running with a Pentium processor and 128 MB of RAM. We expect it should also run with 64 MB RAM.

3 Operating System Configurations Supported

Please read the release notes, packaged with the software, for more details on operating system issues, particularly with respect to window managers.

3.1 UNIX: Solaris 2.6+

The software has been tested on Solaris 2.6. It should run as well on later versions of Solaris. Suggested patches for Solaris to better support JAVA are listed at the SIRTF web site where you download the SPOT software.

3.2 Windows: 95, 98, NT

The functionality of the software has been tested using Windows 95. We have also tested that the software installs and runs under Windows 98 and Windows NT but minimal functional testing has been done on these platforms. SPOT also installs and runs on Windows 2000 (see the release notes).

3.3 Linux: RedHat 6.0, 6.1

SPOT on Linux does not yet run in a stable fashion**. The Java Runtime included with this SPOT release requires at least a glibc-2.1.2 based system with a recent 2.2.x kernel.** It will not run with glibc-2.0 or glibc-2.1[.1] See the release notes for more details about running SPOT under Linux.

The drag-and-drop features that SPOT uses in the constraints editing and duplication tools do not work with Linux. Buttons are provided in both of these tools that allow you to select AORs and targets so that the full functionality is available, regardless of which operating system you are using.

4 Installing and Starting SPOT

SPOT must be installed on the computer where you want to run it. The start-up script is not configured to allow it to run on an X-terminal. (You can run it across a Sparc network if it is installed on a disk that is nfs mounted across the network. We run SPOT in this fashion at the SSC.) The first step is to download SPOT from the SSC Proposal Kit web page onto your hard disk.

4.1 PC Installation

After downloading the software, double-click on the Spot3_5_3.exe file to install SPOT. Click on the SPOT icon to start the program.

4.2 Solaris or Linux Installation

1. Go to the directory where you installed the Spot3_5_3.sh file.
2. At the UNIX/Linux prompt, type **chmod +x Spot3_5_3.sh** to make the file executable.
3. Type **./Spot3_5_3.sh** to run the installation script.
4. When the script asks you for the directory name where you want to install SPOT, be sure to type the full directory path, e.g. /**scr/user/my_spot**. *Make sure the directories exist before you try to install it there*. If you are in the directory **/scr/user/** and just type **my_spot**, it will tell you that the directory name must start with a slash.
5. Type the name of the program (**spot**) to launch it.

5 General Information

5.1 Client-Server Software Interactions

The SPOT software that you download onto your computer acts as the 'client' and requests information over the network from the 'server' software located at the SIRTF Science Center (SSC). The main server that provides observing time estimates for SPOT is called AIRE (AOR Interpreter and Resource Estimator).

Entry of targets and Astronomical Observation Template (AOT) parameters are self-contained within SPOT. An internet connection to contact the servers is required to calculate observing time estimates, obtain visibility windows, and obtain background estimates.

When the servers are accessible by SPOT the net-up symbol (Figure 1) will appear at the bottom of the main SPOT window.

Figure 1: The net-up symbol means SPOT can access the SSC servers. The net must be up to calculate observing time estimates, obtain visibility windows, and obtain background estimates.

If your computer is not connected to the internet or if our servers are temporarily down, the net-down symbol (Figure 2) will appear at the bottom on the main SPOT window.

Figure 2: The net-down symbol means SPOT cannot access the SSC servers. You may still enter target and AOT information when the net is down but you cannot calculate observing time estimates, obtain visibility windows, or obtain background estimates.

Check the release notes if you are using a Windows PC and never see the net-up symbol. This has been noted in two instances and the fix is described in the release notes. If you see the net-down symbol and believe that SPOT should be connected to the servers, please send email to the Help Desk at sirtf@ipac.caltech.edu. We do not yet provide 24-hour support for the SSC servers. We have computer support available weekdays during business hours so if our servers go down late Friday evening they may not come back up until Monday morning.

5.2 On-line Help and Tool Tips

In addition to the release notes, this User's Guide, and the SIRTF Observer's Manual, on-line help for SPOT is available from the help menu on the main SPOT screen. There are also help buttons throughout the program that connect directly to applicable help files.

On-line help is also available in the form of 'tool tips', one-sentence messages that appear whenever the cursor is placed over a field or button for longer than 3 seconds. The tool tips are used to define acronyms, expand abbreviations, and provide instructions for data entry. For example, placing the cursor over the new target (bulls-eye) button in the icon bar results in a small display which says, "Create a new target of any type" (Figure 3).

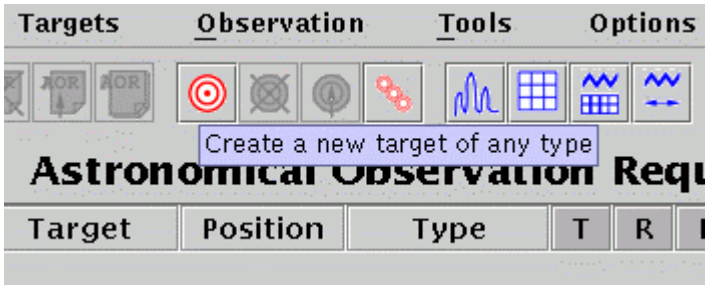

Figure 3: A 'tool tip' is displayed by placing the cursor over the bulls-eye icon. This icon brings up the dialog for creating a new target.

5.3 Time Estimates

Though we will of course not have accurate knowledge of the total duration for executing the different AOTs until after they are commissioned at launch, our goal for this version of the software are uncertainties no greater than 20% of the total 'AOR duration' or 'wall-clock time'. The time estimation software has not yet been fully optimized for performance. The MIPS Photometry/Super Resolution, MIPS Scan Mapping, and IRAC Mapping AOT time estimates are based on actual command expansions and the IRS Staring AOT times estimates are based on algorithms. Though we believe the algorithmic time estimates to be accurate, they are inherently less certain since the command expansions have not yet been implemented.

SPOT reports four different times when you request an observing time estimate:

1. **AOR Duration**: This is the 'wall-clock' time or total time required to execute the observation, including time on source, internal calibrations, slewing, settling, command execution, and the fixed slew overhead applied to each AOR. This is the time you must request in your proposal for this observation.
2. **Slew Time**: The time spent on slews internal to the AOR.
3. **Settle Time**: The time required for the telescope to settle after slews internal to the AOR.
4. **Slew Overhead**: A 180 second overhead applied to all AORs to account for the initial slew to source and other observatory overheads.

SPOT returns observing time estimates from AIRE for the four First-Generation AOTs (section 10). To calculate times for the Second-Generation AOTs (section 11) use the links provided on the Proposal Kit web page.

5.4 Maximum Duration of AORs

The duration limits for all AORs are 3 hours for MIPS and 6 hours for IRAC and IRS. If the estimated duration of your AOR is longer than these times the software will return a message telling you to make the observation shorter for the First-Generation AOTs. For the Second-Generation AOTs, do not enter a time estimate that is larger than these limits as the software does not check this for you.

The 3-hour limit for MIPS is the maximum duration allowed at any time. The 6-hour limit for IRS and IRAC is our best current estimate. Particularly early in the mission, AORs longer than about 3 hours may be difficult to schedule. If your science results in AORs substantially longer than this you can create separate shorter duration AORs and use a sequencing constraint (section 14.3) so that they are executed serially.

6 SPOT Menus

SPOT has seven menus that provide the tools needed to create your AORs. Details of many of these functions are discussed in later sections and section 6.8 gives a single page summary of all the SPOT menu items. The menus provide the following functions.

6.1 File Menu

File I/O is handled from this menu. Three functions (plus Quit) are implemented.

6.1.1 Read AORs and Targets

This function opens a dialog to select a file of targets or AORs that has previously been written out with SPOT. AOR and target files are plain ascii text files created by SPOT with the formatting required by the software. SPOT expects AOR files to have the suffix '.aor' and SPOT target files to have the suffix '.tgt'. Sample files illustrating the format required for targets and AORs are included in sections 15 and 16.

The 'Read AORs and Targets' dialog is shown in Figure 4. You can browse directories and select a target or AOR file from the list or type in the name. At the bottom of the dialog you can select the method SPOT should use for handling duplicate AORs, i.e. if an AOR file you are reading in contains an AOR with the same 'Unique AOR Label' as one already loaded in SPOT. The default is for SPOT to read in the duplicates and append 'copy' to the labels, so that they remain unique.

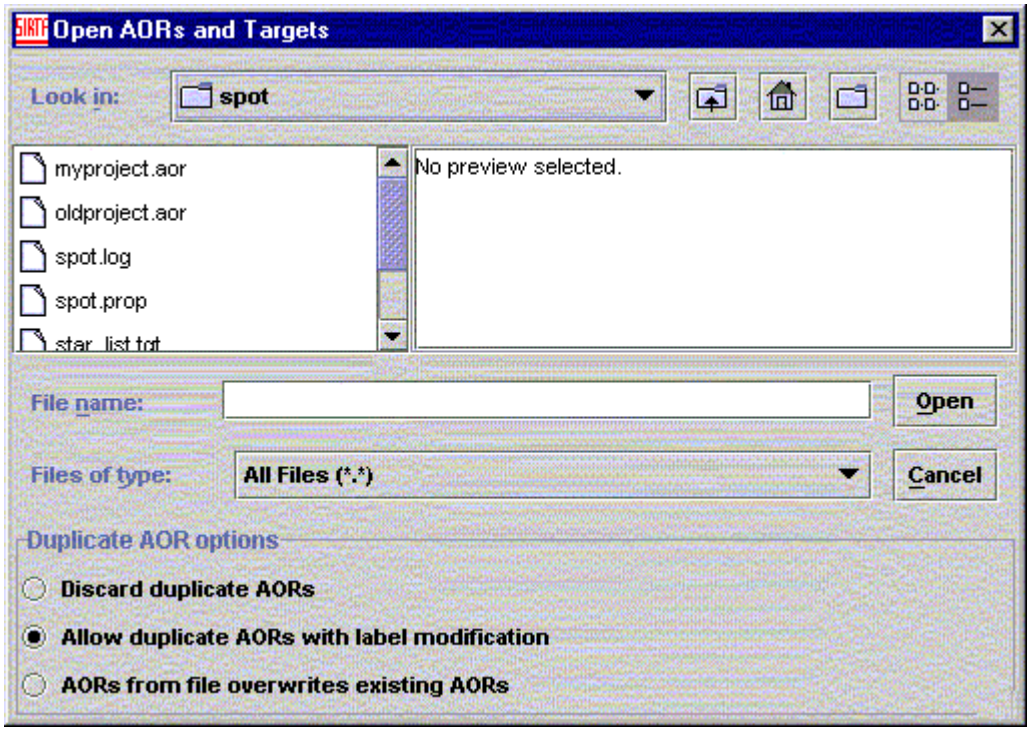

Figure 4: The 'Open AORs and Targets' dialog.

6.1.2 Save AORs and Targets

This function opens a dialog to allow you to write out either your targets (in SPOT format, see section 15) or your AORs to text files. SPOT writes out AOR files with the suffix '.aor' and SPOT target files have the suffix '.tgt'. These are plain ascii text files created by SPOT with the required formatting. Sample files illustrating the format required for targets and AORs are included in sections 15 and 16.

When writing out AOR files you can either write out all of your AORs or a subset of files for which you have set the 'ON' flag. ***It is important that you save your AORs before exiting SPOT, otherwise your work will be lost. SPOT does not save AORs or targets to disk automatically.*** If you do not select a directory in which to save your files, the default directory is:

UNIX/LINUX	~/.spot
Windows 95,98	c:\spot
Windows NT	c:\Winnt\Profiles\{username}\spot

When you select 'Save AORs and Targets' the dialog shown in Figure 5 opens. The default function for this dialog is to save AORs to a file. In this example SPOT would create a file called 'newfile.aor'. (If you include the '.aor' suffix in the File name, SPOT will also create 'newfile.aor'.) A sample AOR file is shown in section 16.

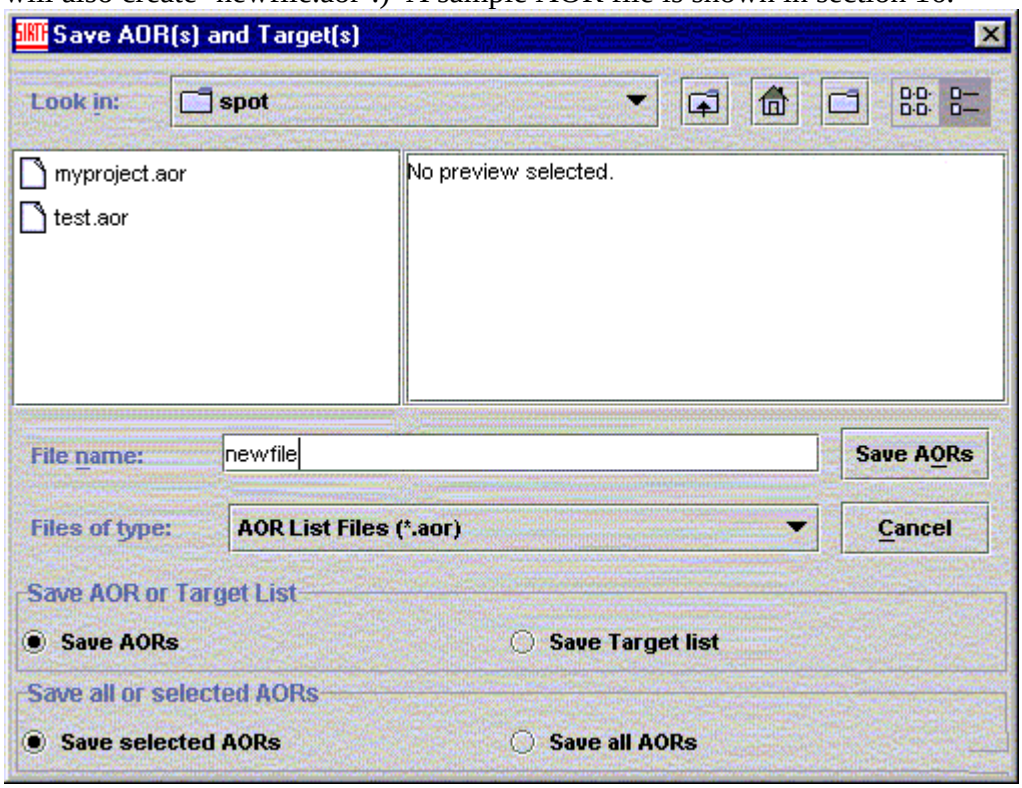

Figure 5: The 'Save AORs and Targets' dialog is shown with the 'Save AORs' radio button selected.

If instead of saving a file of AORs you want to save just targets to a file, select the 'Save Target list' radio button near the bottom of the window. The dialog then changes to the

form shown in Figure 6. SPOT is now ready to save a file of the currently entered targets called ‘newfile.tgt’.

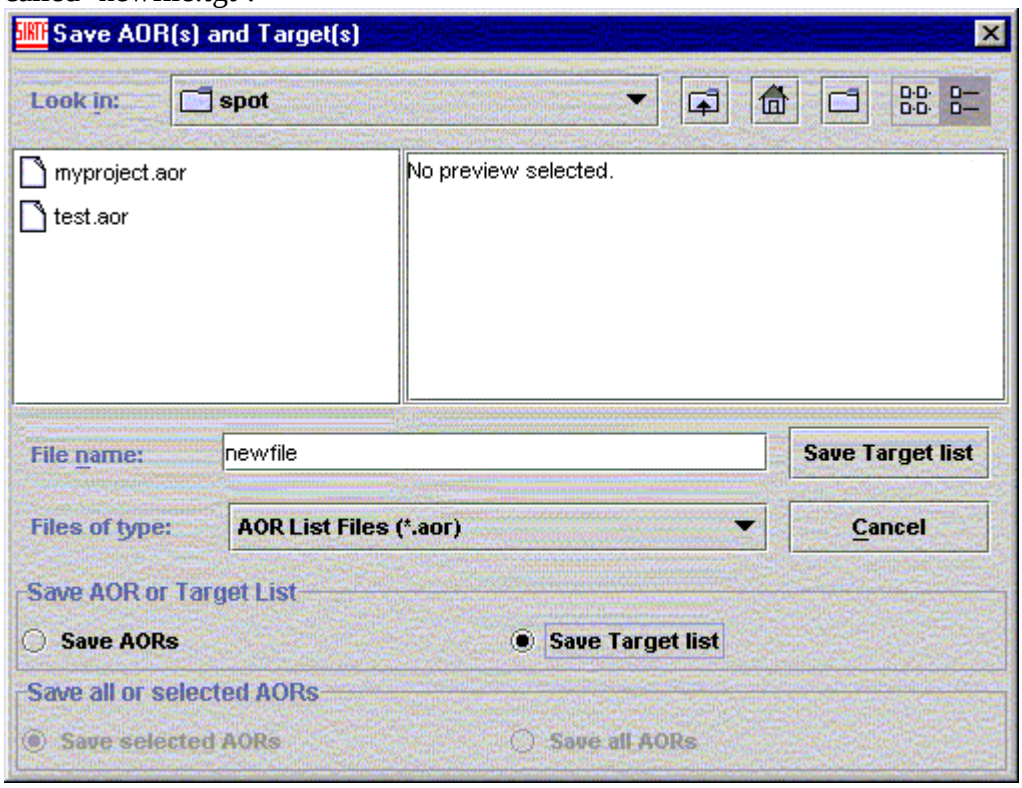

Figure 6: The ‘Save AORs and Targets’ dialog is shown after selecting the ‘Save Target list’ radio button. SPOT will save the targets you have entered to a file using the format shown in section 15.

6.1.3 Read Fixed Single Target List

SPOT can read in single target/line lists for inertial targets. This function has not yet been implemented for fixed cluster targets or moving targets. A sample file is shown here and the required format of the file is described.

```
COORD_SYSTEM: Equatorial        # Equatorial, Galactic, or Ecliptic
EQUINOX: B1950                  # B1950, J2000, or blank for Galactic

#  Name         RA/LON          DEC/LAT         PM-RA PM-DEC EPOCH
"NGC 001"       12h34m23.45s    34d23m56.2s     2.3   3.4    1950.3
NGC2222         23.56d          34.456d         2.3   3.4    1950.3
NGC3333         23.56h          34.456d         2.3   3.4    1950.3
NGC4444         "12 34 12.23"   "34 23 45.45"   2.3   3.4    1950.3
```

- The first two keywords give the coordinate system and equinox for all the positions in this list.
- The list columns are separated by *spaces*. If there are spaces in the values for a column, double quotes are needed surrounding the value.
- Any line starting with the pound sign (#) will be treated as comments.

- Proper motion for RA and DEC are not required and may only be entered for Equatorial coordinates. They must always be supplied in pairs (RA and Dec).
- If the value for the fourth column is larger than 1900.0, it is interpreted as the epoch. The epoch field should only be entered for equinox B1950 coordinates.
- You need to make separate lists for Equatorial J2000, Equatorial B1950, Galactic, etc. These can then be read in one file at a time.

You can create targets in the format required by SPOT with a text editor and then read in these files. Samples of all types of targets, in the proper format, are given in section 15.

6.2 The Edit Menu

The functions in the edit menu are:

- Undo last action [ctrl-Z]
- Delete current AOR [ctrl-X]
- Modify current AOR [ctrl-M]
- Copy current AOR [ctrl-C] – This makes a duplicate entry of the selected AOR. The unique AOR label is automatically edited with the addition of ‘copy’ to remain unique.

The following functions in the edit menu refer to the ON flag that is listed in the AOR table. These functions are most likely to be used if you are planning to write out a subset of your AORs to a file or recalculate resource estimates.

- Enable All AORs [ctrl-E] -- This turns the flag ON for all AORs.
- Disable all AORs without Constraints [ctrl-D] -- This turns the flag OFF for all AORs that are not part of a constraint.
- Toggle the On Flag (AORs without constraints) -- For all AORs that are not part of a constraint, this turns the flag from OFF to ON, or ON to OFF. Once you have added constraints, SPOT won’t let you turns these AORs OFF. This prevents you from writing out constraints without their associated AORs.

6.3 Targets Menu

The functions in the Targets menu are:

- New Target - Enter a new target from the target entry window.
- Delete Target - Delete the currently selected target. The name of the current target is displayed at the bottom of the main screen.
- Modify Target - Bring up a target entry dialog with the current target loaded.
- Target List -- Open a dialog showing a summary list of the targets currently loaded. Clicking on an entry makes this target the 'current' target.

As you enter targets into SPOT, they appear at the bottom of the Targets pull down menu.

The targets in the Target List and the AORs are not linked. If you change the coordinates in a target that you have already entered into an AOR, they are NOT updated in that AOR, unless you modify the target from within the AOT dialog.

To change the coordinates for a target already included in an AOR, load the AOR file into SPOT, open the AOR file, then select the Modify Target button to correct the coordinates. If you read in a list of AORs and you have used the same target in more than one AOR it will appear multiple times in the target list.

6.4 Observation Menu

The selection of the desired AOT parameters is made from the Observation menu. *The SIRTF Observer's Manual is your primary reference for information about using the SIRTF instruments and selecting the appropriate AOT parameters.* Additional comments about the AOTs are in sections 10 and 11 of this guide.

There are (currently) seven SIRTF AOTs. The First-Generation AOTs appear in blue and the Second-Generation AOTs appear in yellow in the observation menu. The four First-Generation AOTs (planned for commissioning right after launch) are:

- IRS Staring Mode
- IRAC Mapping
- MIPS Scan Map
- MIPS Photometry/Super Resolution

The three Second-Generation AOTs are:

- IRS Spectral Mapping
- MIPS Spectral Energy Distribution
- MIPS Total Power Mode

These Second-Generation AOTs will be unavailable to general observers prior to GO Cycle 2. See the Observing Policies (policy number 8) for information about the use of Second-Generation AOTs by Legacy Proposers.

6.5 Tools Menu

6.5.1 Visualization

No visualization tools are implemented in this version of SPOT. The separate IPAC tool IRSky is available. IRSky is an X-Windows based package available through telnet access to irsky.ipac.caltech.edu, userid: irsky, no password (or you can access it from the IPAC homepage or through the Proposal Kit web page). With IRSky you can overlay the SIRTF focal plane on ISSA 12, 25, 60, and 100 micron maps of the sky to help you visualize your SIRTF observations. It will not indicate movements of the focal plane if you wish to map a region using a specific AOT with SIRTF. IRSky will allow you to input a position angle (that SPOT will calculate for you, see section 9.8) to indicate how

the SIRTF focal plane will appear on the sky when in orbit. Note that you will need an X-Windows emulator if you access IRSky from a PC.

6.5.2 Duplication Tool

The Duplication Tool allows SPOT to automatically create a number of AORs by merging a 'template' AOR and a list of targets. For every target in your selected group, an AOR with the template parameters will be created. The Duplication Tool is discussed in section 13.

6.5.3 Group/Follow-on Constraints

This tool allows you to apply grouping and follow-on constraints to your AORs. See section 14 for a discussion of constraints editing.

6.5.4 Timing Constraints

This tool allows you to apply timing constraints to an AOR. See section 14.

6.5.5 Show Current Resource Estimates

This brings up the resource estimates dialog that shows the time estimates previously calculated for this AOR. The same function is implemented with the 'clock' icon on the main SPOT screen.

6.5.6 Recompute All Estimates

This function recomputes the observing time estimates for either the current AOR, the AORs with the ON flag set, or all the AORs loaded into SPOT. The user selects the appropriate set to use from a button on the dialog shown in Figure 7. As SPOT recomputes the estimates they are updated in the main AOR table.

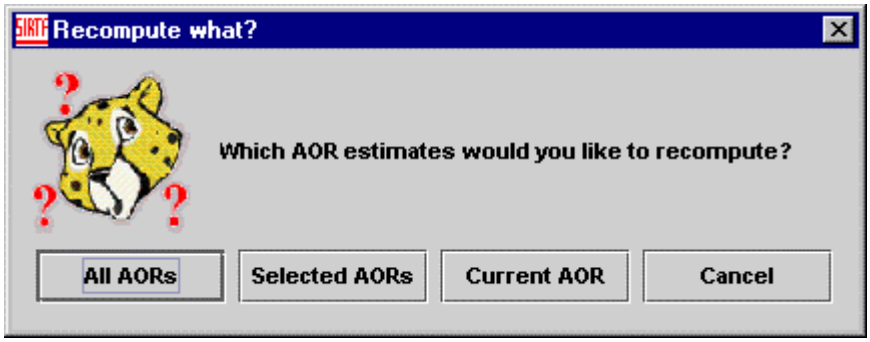

Figure 7: The dialog that appears if Recompute All Estimates is selected from the Tools menu. The user selects the set of AORs to use by clicking the appropriate button.

6.6 Options Menu

The Options menu currently provides only one function:

6.6.1 User Automatic SPOT Version Update

The default for this is ‘yes’. If an update for SPOT is available, when you start SPOT and connect to our server you will be asked if you would like to update your software. If you do then the update will downloaded and installed on your computer.

6.7 Help Menu

6.7.1 Help: Overview

This is the access point to the SPOT on-line help. Please also see the SIRTF Observer's Manual and the SPOT Release Notes, as well as the additional information available on the SSC Proposal Kit web page.

6.7.2 Changes in AOR file v3.0->v3.5

This item is for the SIRTF Guaranteed Time Observers. It explains changes that may be made to AOR files read in to SPOT version 3.5 that were created with the beta version 3.0.2.

6.7.3 Help: About

This function reports the version of SPOT running on your computer and the version of the AIRE server at the SSC that you are accessing to calculate resource estimates.

On the following page we provide a summary list of the functions available from all of the SPOT menus.

6.8 SPOT S3.5 Menu Command Summary

```
FILE MENU
      Read AOR(s) and Target(s) [ctrl-R]
      Save AOR(s) and Target(s) [ctrl-S]
      Read Fixed Single target list
      Load AORs from database... (Unavailable)
      Resubmit AORs... (Unavailable)
      Quit

EDIT MENU
      Undo              [ctrl-Z]
      Delete current AOR      [ctrl-X]
      Modify current AOR      [ctrl-M]
      Copy current AOR  [ctrl-C]
      Enable All AORs         [ctrl-E]
      Disable all AORs without Constraints      [ctrl-D]
      Toggle the On Flag (AORs without constraints)

TARGET MENU
      New Target  [ctrl-T]
      Delete Target
      Modify Target
      Target List

OBSERVATION MENU
      IRS Staring
      IRS Spectral Mapping
      IRAC Mapping
      MIPS Scan Map
      MIPS Photometry/Super Resolution
      MIPS Spectral Energy Distribution
      MIPS Total Power

TOOLS MENU

      Visualization (Unavailable)
      Duplication tool
      Group/Follow-on Constraints
      Timing Constraints
      Show Current Resource Estimates [ctrl-A]
      Recompute All Estimates

OPTIONS MENU
      Use Automatic Spot Version Update

HELP
      Overview
      Changes in AOLR file v3.0->v3.5
      About
```

7 SPOT Main Screen

7.1 Icons

SPOT uses several icons as shorthand for commonly used functions also available under the top menus. They are shown in Figure 8. From left to right the icons are:

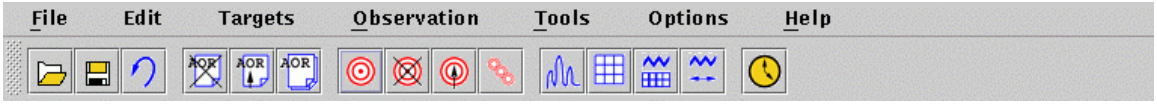

Figure 8: The menus and icon bar on the SPOT main screen provide access to the various functions within SPOT.

- half-open folder = read in AORs/targets from a file
- diskette = save AORs/targets to a file
- curved arrow = undo last action

The next three AOR icons become active once you have defined AORs.

- X = delete the current AOR
- arrow = modify the current AOR
- double page = duplicate the current AOR

The four bulls-eye icons are for manipulating targets.

- bulls-eye = new target
- bulls-eye + X = delete target
- bulls-eye + arrow = modify target
- 3 small bulls-eyes = show the current target list

The next four icons bring up the different First-Generation AOTs.

- spectrum = IRS Staring Mode
- 3 x 3 grid = IRAC Mapping
- zigzag with grid = MIPS Photometry/Super Resolution
- zigzag with double arrow = MIPS Scan Map

The last icon, a clock, brings up a window that displays the time estimates for the currently selected AOR. This is the same as the ‘Show Current Resource Estimates’ function that is available from the Tools menu (section 6.5.5). It does not recalculate the time estimates.

7.2 AOR Table

The list of AORs currently loaded in SPOT is shown on the main screen (Figure 9) in the AOR table. For each AOR it lists:

- Unique AOR Label
- Target Name
- Abbreviated Target Position
- Target Type
- T = timing constraint flag
- G = grouping constraint flag
- F = follow-on constraint flag
- Instrument = AOT selected
- Duration = total wall-clock time in seconds for this AOR
- Stat = status of this AOR (always `new' in this version)
- ON flag

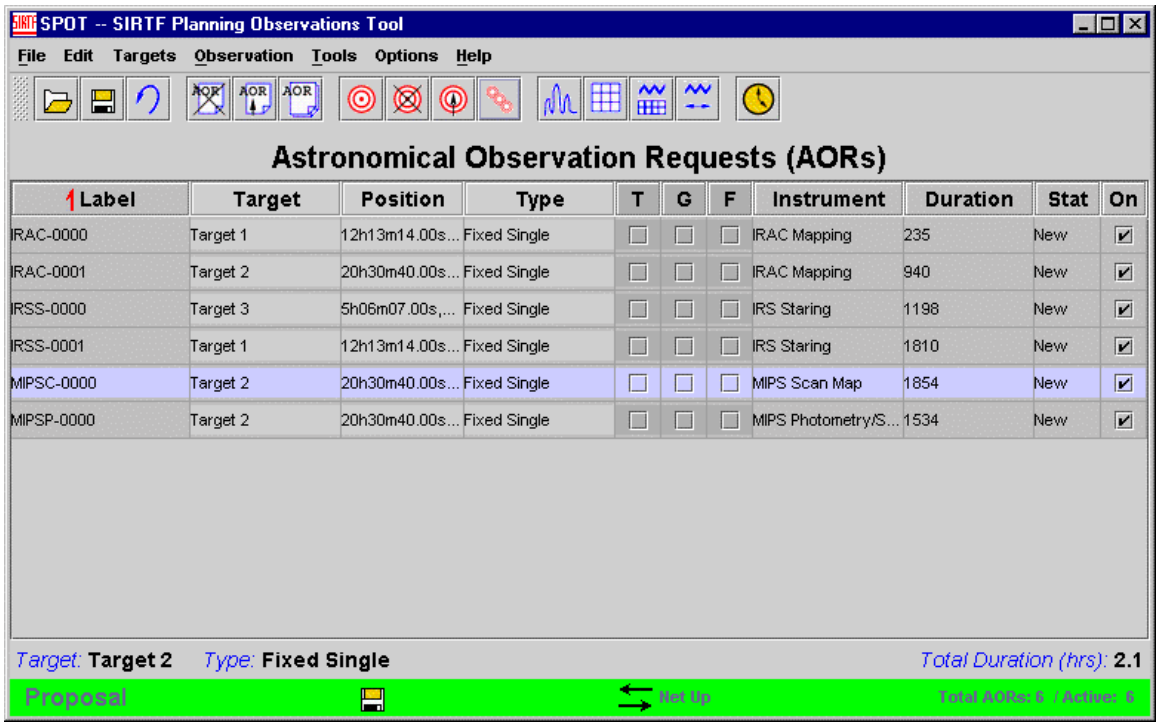

Figure 9: The main screen shows the AOR table, displaying the AORs currently loaded into SPOT.

Tables formatted in the JAVA language have several features that can be exploited while using SPOT. The columns can be rearranged by clicking on and dragging the column headers. Simply clicking on a column header enables sorting of the table by the column contents. When the header is clicked upon, red or blue arrows appear next to the column header. The red arrow signifies sorting in increasing order and the blue arrow indicates sorting in decreasing order. Click on the arrow to do the sorting. You may edit an AOR

by double clicking on it or delete an AOR by selecting it and clicking on the Delete Current AOR button. By clicking and dragging on the edge of the header cell, you can change the width of the column.

7.3 Bottom Bar

At the bottom of the main screen SPOT provides information about the currently selected target as well as information about the status of the network and the total amount of time to execute all or a selection of the AORs loaded in SPOT (Figure 9). The information provided is:

- Target – The name and type of the currently selected target are shown at the bottom left of the main screen.
- Total Duration – The total amount of time, in decimal hours, for the AORs that have time estimates and are currently loaded (and selected as ON), is shown in this field in the lower right corner. If you click on this field the format toggles between decimal hours and hours:minutes:seconds.
- Proposal - This will show the proposal/project number in future versions.
- Disk Icon - If you have entered AORs into SPOT that have not yet been saved to a file, the diskette icon will appear in the bottom bar of the main window. You may save your AORs by clicking this icon, clicking the disk icon in the upper icon bar, or selecting 'Save AORs and Targets' from the file menu.
- Net Icon - The net-up or net-down words and symbol give you the current status of your connection to the servers at the SIRTF Science Center if you are connected via the internet. If the network is down, or you are working offline, you can still enter target and AOT information into SPOT, but you cannot obtain time estimates, background estimates, visibility windows, or orient information (see section 5.1).
- Total AORs/Active – If you have AORs loaded, on the far right of the bottom bar SPOT reports how many AORs are currently loaded, and how many are active, i.e. the ON flag is checked.

8 Entering An Astronomical Observation Request

Creating an AOR for SIRTF consists of entering targets which are individually linked to a desired SIRTF observing mode or Astronomical Observation Template (AOT), and then obtaining a time estimate. The basic steps in completing an AOR are:

8.1 Start the SPOT software

Launch SPOT by either clicking on the SIRTF icon (PC) or running the program by typing $PATH/spot for UNIX or Linux installations.

8.2 Enter Target Information

Enter a target by selecting "new target" from the target menu or clicking on the bulls-eye icon. You may also read in a list of targets via the file menu using "Read Fixed Single Target List" or "Read AORs and Targets." The details of entering a target are described in section 9.

8.3 Fill Out an Astronomical Observation Template

Select an AOT from the Observation menu. The instrument configuration and integration time parameters are entered in the AOT form. *The SIRTF Observer's Manual is the primary reference for information to use in planning your science observation.* Some additional comments are provided in this User's Guide in Sections 10 and 11.

Unique AOR Label:

The first field at the top of each AOT is the 'Unique AOR Label'. The contents of this field must be different for each AOR you enter. SPOT provides a default name (e.g. IRSS-0000 for the first IRS Staring AOR). You can use the default naming system, or a naming system of your choice. You might include a project name or abbreviation with a number, or you can use something simple like numbers or letters.

Do not use periods (.) in the AOR Label field. You may use alphanumeric characters, the dash (-), and the underscore (_).

Target Buttons:

From each AOT there are buttons that allow you to create a new target, modify the currently selected target, or view the current list of targets. These work in the same fashion as the target menu items and target icons***. If you have previously saved an AOR and want to modify the target parameters, you must modify the target using the Modify Target button on the AOT form***.

8.4 Obtain Resource Estimates

Determine how long your observation as specified will take to execute by clicking on the Compute Obs. Time button. If you are connected to our servers via the internet, SPOT will return resource estimates in the dialog shown in Figure 10. The most important number returned here is the AOR Duration. This is the wall-clock time that SIRTF will

require to execute the observation. You need to request this amount of time for the observation in your observing proposal.

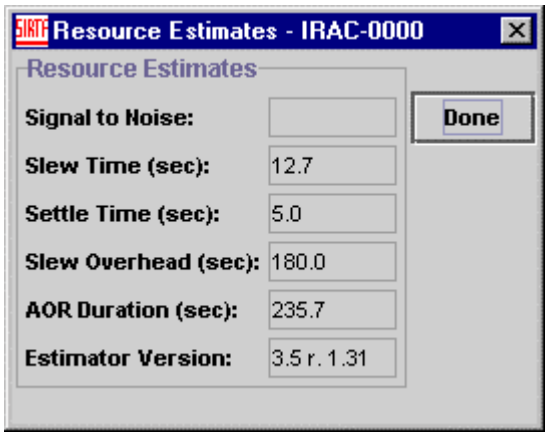

Figure 10: The Resource Estimates Dialog

We will be providing more information in the resource estimates dialog in a future release of SPOT. The information returned in the resource estimate dialog is:

Signal-to-Noise: This feature is not yet implemented.

Slew Time: This includes the time for telescope moves internal to the AOR, e.g. to move between map positions, dither positions, or different slits.

Settle Time: The settle time reports the time required for the telescope to settle after moves internal to the AOR.

Slew Overhead: The slew overhead is a fixed time included in each AOR that accounts for the initial slew to target and other observatory overheads. The value is currently 180 seconds.

AOR Duration: This is the total wall-clock time required to execute the observation.

Estimator Version: This is the version of the AIRE server that is calculating the resource estimates.

8.5 Other AOT Buttons:

8.5.1 Source Flux Density

You may enter known/estimated flux densities for your targets by clicking this button. This information is not used in the current version of SPOT but is saved with the AOR. Flux densities may not currently be entered for moving targets. This will be fixed in a future release. For moving targets, if you wish to save flux density information with your AOR, please enter it into the comment field.

8.5.2 Sensitivity

SPOT returns the location on our web site of the sensitivity pages for all three instruments. You must access these from your web browser separately. SPOT does not yet provide integrated sensitivity estimates. There are also links from the SIRTF Proposal Kit web page. The URLs are:

IRAC: http://sirtf.caltech.edu/SciUser/IRAC/irac_sens.html

IRS: http://sirtf.caltech.edu/SciUser/IRS/irs_sens.html

MIPS: http://sirtf.caltech.edu/SciUser/MIPS/mips_sens.html

8.5.3 Comments

This is a text field where you may enter any additional information that you wish to save with your AOR.

8.6 Save AORs

Save the AORs you have created from the File menu function or by clicking on the diskette icon in the icon bar or at the bottom of the main screen. AOR files are saved with the suffix '.aor'. If you do not include it in the file name that you enter into the file name field, SPOT will append it for you. For example, if you enter the name 'project', SPOT will create a file called 'project.aor'. If you do not select a specific directory, SPOT saves these files in the default directories listed below.

UNIX/LINUX	~/.spot
Windows 95,98	c:\spot
Windows NT	c:\Winnt\Profiles\{username}\spot

It is important that you save your AORs before exiting SPOT, otherwise your work will be lost. SPOT does not save AORs or targets to disk automatically.

8.7 Second-Generation AOTs

The second-generation AOTs are not yet implemented in AIRE so there are no resource estimates provided in SPOT. The instructions for completing these AOTs are described in section 11.

9 The Target Entry Dialog

Several SPOT features are available from the target entry dialog. A new target entry dialog is opened by selecting 'New Target' from the Targets menu or clicking the bulls-eye icon on the main screen. The target entry dialog is shown in Figure 11.

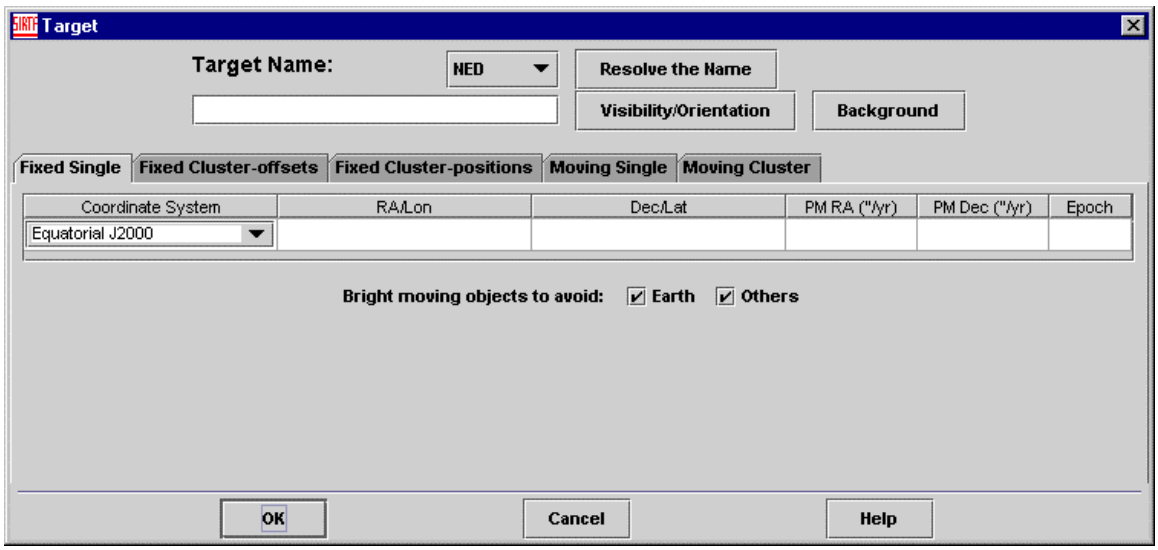

Figure 11: The target entry dialog is shown. The five types of targets are selected from the tabs.

We discuss below the target types, target coordinate systems, and target entry formats supported by SPOT. The other features accessed from the target entry dialog are:

- NED Target Name Resolution.
- Sky Background Estimates for inertial targets.
- Visibility Windows for inertial and moving targets.
- Position Angle of the SIRTF focal plane for a given target and date.
- Position Angle of the IRS Slits for a given target and date.
- Avoidance of Bright Moving Objects that might be in your target field.

9.1 Target Types

You must define your target using one of the following target types. These are selected from tabs in the target entry dialog.

9.1.1 Fixed Single

A fixed-single target is one object or map center outside of the solar system. The entry dialog is shown in Figure 11.

9.1.2 Fixed Cluster-offsets and Fixed Cluster-positions

A 'cluster' in SPOT is not necessarily an astronomical cluster. It is a group of positions in a region of sky with a radius of less than 1 degree to be observed with the same AOT

parameters. The positions can be entered as offsets from a primary position or as individual absolute positions. Target clusters are envisioned as sets of objects that have a scientific requirement for observation in close spatial and temporal proximity. An entry dialog for a fixed cluster-offsets target is shown in Figure 12.

9.1.3 Moving Single

A moving single target is a single object that requires Solar System tracking.

9.1.4 Moving Cluster

A moving cluster is a group of co-moving Solar System targets separated by less than 1 degree to be observed with the same AOT parameters. The positions are entered as a primary target and offsets from that position. The ephemeris for the primary target determines the tracking rate to be used for the entire cluster, but the primary target itself does not have to be observed as part of the cluster.

If you select the option 'Observe Offsets Only', so as not to observe the primary target position, see the special instructions in section 12.2 for submission of these AORs.

9.2 Inertial Target Coordinate Systems

SPOT allows the entry of coordinates in five different systems for inertial targets. If not input in J2000, the coordinates will be translated internally from the input system to the J2000 system for executing the observation. A fixed cluster-offsets dialog is displayed in Figure 12 with the menu showing the five coordinate systems that SPOT can accept as input. These are:

- Equatorial J2000 -- Enter the RA, Dec, and proper motions if applicable. The epoch field is not used.
- Equatorial B1950 -- Enter the RA, Dec, proper motions if applicable, and the epoch for the 1950 coordinates. The epoch field has a default value of 1950.0. The epoch will be used to properly transform the B1950 coordinates to J2000.
- Galactic - Enter the galactic longitude and latitude. No proper motion or epoch entries are allowed.
- Ecliptic J2000 - Enter the ecliptic longitude and latitude. No proper motion or epoch entries are allowed.
- Ecliptic B1950 -- Enter the ecliptic longitude and latitude, and the epoch. The epoch field has a default value of 1950.0.

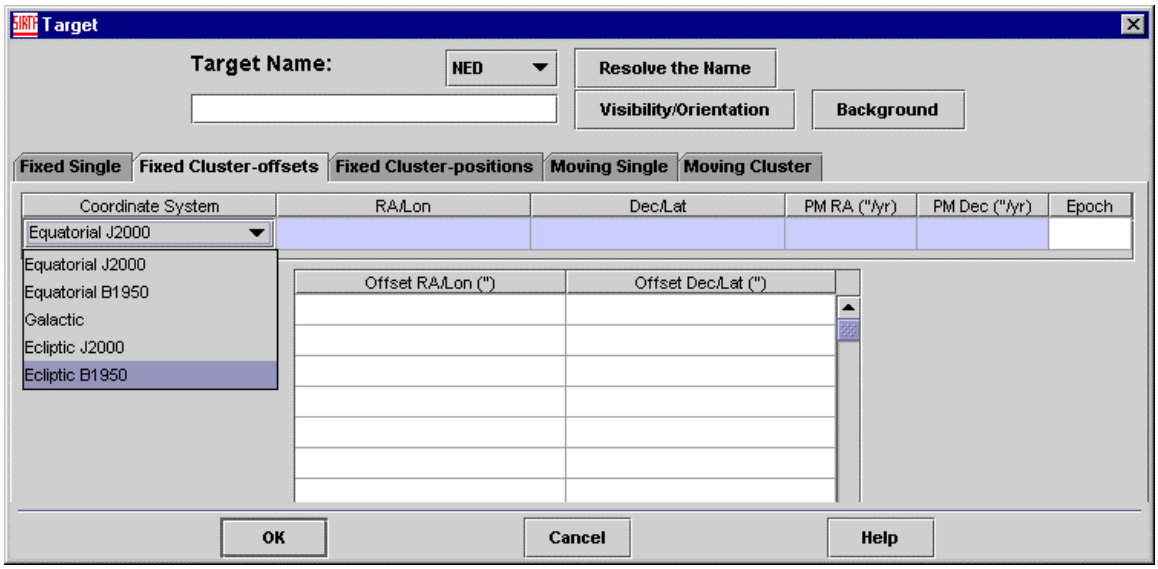

Figure 12: The entry dialog for a fixed cluster-offsets target with the menu showing the five coordinates systems available for coordinate entry for inertial targets.

9.3 Coordinate Entry Formats

You may enter inertial coordinates in a variety of formats.

- Equatorial RA
  12:5:10
  12:05:10
  12 5 10
  12h5m10s
  12.5 (= 12.5 hours of RA = 12h30m00s)
  12.5d (= 12.5 degrees)

- Equatorial Dec
  12:5:10
  12:05:10
  12 5 10
  12d5m10s
  12.5 (= 12.5 degrees = 12d30'00")

You may not enter the declination as 12d5'10". This is to prevent confusion between quotation marks and arcminutes or arcseconds when coordinates are read in from a list. Declinations are also displayed with ‘m’ standing for arcminutes and ‘s’ standing for arcseconds.

- Galactic/Ecliptic - Enter longitude and latitude in decimal degrees: 12.5 or 12.5d

9.4 Moving Target Entry

For moving targets you may enter either a standard ephemeris specified by the NAIF ID number or a user-defined ephemeris for objects not yet in the NAIF database.

9.4.1 Standard Ephemeris

For targets in the NAIF database enter either the NAIF ID or the target name, and SPOT will return the appropriate target name or NAIF ID number. A list of NAIF IDs and names recognizable to SPOT can be found on the SIRTF Proposal Kit web page.

If the name you enter is used by more than one object in the NAIF database, for example Dione the satellite and Dione the asteroid (Figure 13), SPOT will provide you with a list of NAIF IDs to select from (Figure 14). *It is important to select the correct NAIF ID for your object, as the NAIF ID is the single identifier SIRTF uses to provide ephemeris information for planning and scheduling.*

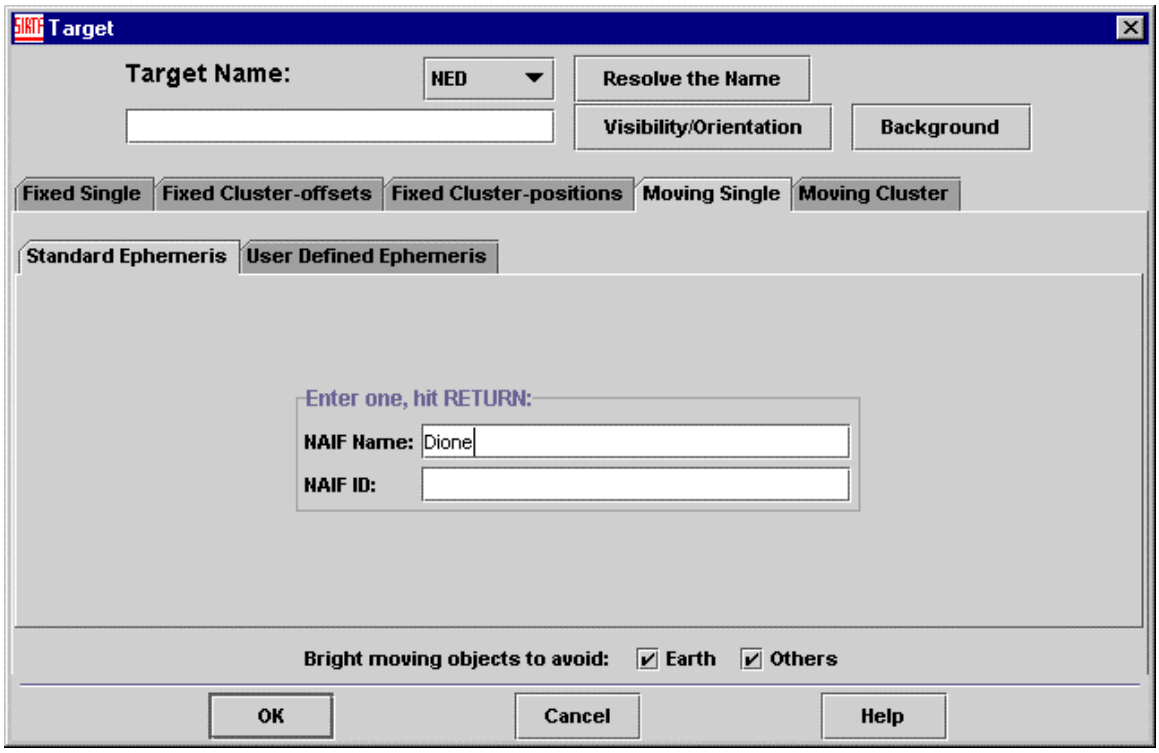

Figure 13: The moving single target entry dialog is shown with the name Dione entered. It will find the list of NAIF IDs for you to choose from to specify Dione the satellite versus Dione the asteroid.

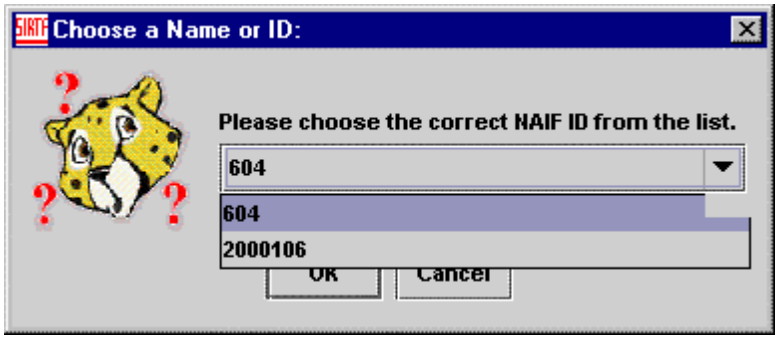

Figure 14: The choices of NAIF ID numbers for Dione are shown. It is important to select the correct NAIF ID for your object, as the NAIF ID is the single identifier SIRTF uses to provide ephemeris information for planning and scheduling.

As a rough guide to distinguishing between NAIF IDs, NAIF numbering has the following conventions:

- 7-digit numbers starting with "1" - comets
- 7-digit numbers starting with "2" - numbered asteroids
- 7-digit numbers starting with "3" - relatively newly discovered objects (e.g. some asteroids and KBOs)
- 3-digit numbers - planets and planetary satellites
- 1-digit numbers - planetary system barycenters

9.4.2 User Defined Ephemeris

For targets not yet in the NAIF database you may enter the orbital elements. The entry dialog is shown in Figure 15. We require the following heliocentric ecliptic elements to specify the orbit of your newly discovered object:

- Epoch: The Julian ephemeris date (Time Dynamic Barycenter) of the osculating elements.
- T: Perihelion Julian Date
- ω: Argument of perihelion with respect to the ecliptic (degrees).
- Ω: Longitude of the ascending node with respect to the ecliptic (degrees).
- Eccentricity: Eccentricity of the orbit (in the range 0 to 1).
- Perihelion Distance: Perihelion distance for the orbit in AU.
- Inclination of Orbit: Inclination of the orbit with respect to the ecliptic (degrees).

Orbital elements should be specified with a reference frame of FK5/J2000.0.

We do not have an automatic way to use these elements to generate an ephemeris within SPOT. Consequently if you need a user-defined ephemeris please contact the SIRTF Help Desk (sirtf@ipac.caltech.edu) with your orbital elements and request generation of a SPOT-readable ephemeris for planning purposes. We will generate a temporary ephemeris for you and give you a dummy NAIF ID number to use within SPOT so that you can generate visibility information, etc. for your target.

However, when you submit your final AORs please do not use the dummy NAIF ID number, but rather enter the orbital elements in the window provided and submit those. Note that we require the orbital elements to be entered with respect to an ecliptic and mean equinox of J2000.

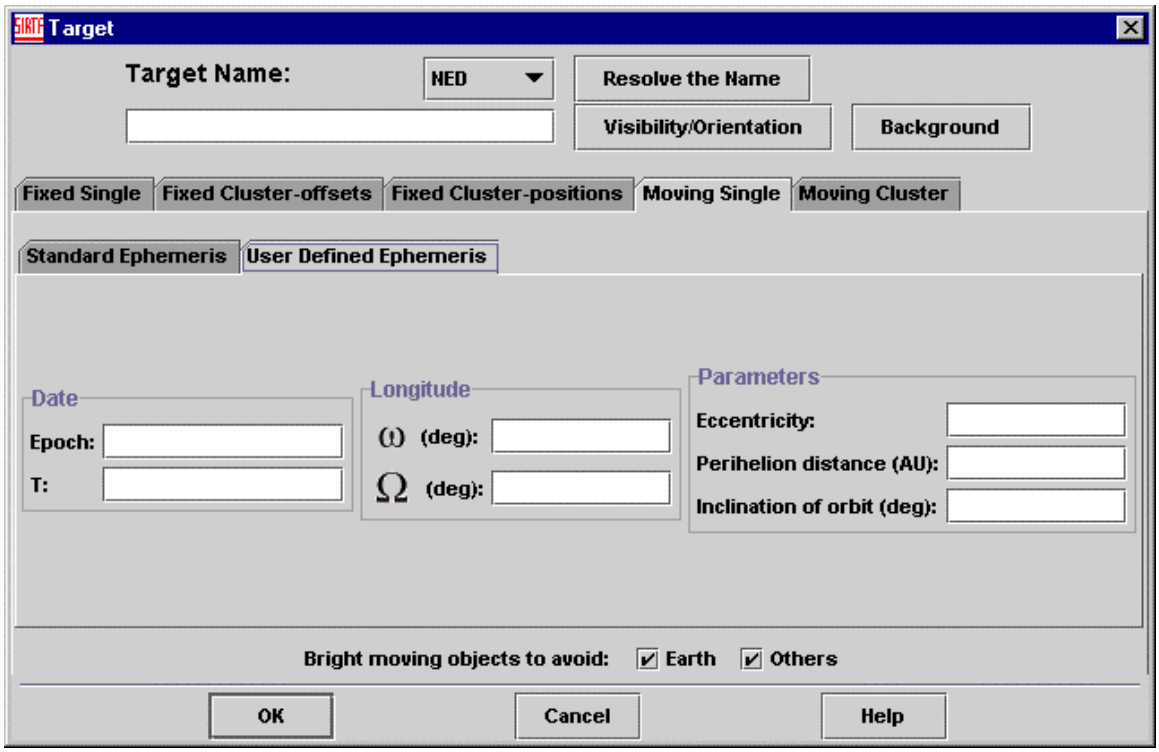

Figure 15: The entry dialog for a moving single target with a user defined ephemeris. This is where you enter a target that does not yet have a NAIF ID number.

9.4.3 Shadow Observations

Some solar system observations of faint or extended sources will require "shadow observations", that is, a determination of the background under a moving object, after that object has moved. "Shadows" for imaging observations of compact sources can be performed as two exposures on the target, typically separated by the time required for the target to move one to three diffraction diameters. For large-area extended moving targets, or spectroscopy, shadow observations may be required to duplicate the identical pointing and track performed on the science observation.

Shadow observations should be specified in this version of SPOT using the timing constraints (section 14.2) and the comment field. For compact sources, the target observation and its corresponding shadow can be set up as a pair of linked observations using the follow-on constraint (section 14.3), with or without an absolute time constraint on the first observation. For the shadow observation in this pair, entering the target as a moving cluster with the observe offsets only option will allow you to enter an offset to place the original target position (now background) into the center of the detector, if desired. For shadow observations that require duplication of the target track after the target has moved, enter these also as paired observations with follow-on constraints, but

also enter a note into the comment field specifying that this is a shadow observation that requires duplication of the original target track.

9.5 NED Target Name Resolution

Name resolution of targets in the NASA/IPAC Extragalactic Database (NED) is available in this version of SPOT. SIMBAD name resolution will be implemented as well in a future release. After entering the target name, click on the Resolve the Name button on the target entry dialog. If the target is found in NED, SPOT will enter the coordinates automatically into the dialog.

9.6 Bright Object Avoidance

SIRTF observations can be compromised by the presence of a bright object in or near your target field. For bright stationary objects, this potential hazard can be assessed by checking catalogs of known sources (e.g. using IRSky). SPOT does no automatic checking for bright inertial targets. This is the responsibility of the observer.

However, it is much harder to anticipate the presence of bright solar system objects in your target field on a given date. Consequently SPOT provides a feature that calculates visibility windows for your object that automatically designate your target as "not visible" if it is close to a bright moving object at that time. This feature is implemented at the bottom of the target entry dialog.

There are two checkboxes that allow you to:

1. Avoid Earth (which also avoids the Moon).
2. Avoid Others: This option avoids a list of bright objects that currently includes the following sources -- Mars, Jupiter, Saturn, Uranus, Neptune, and the asteroids 4 Vesta, 6 Hebe, 1 Ceres, 7 Iris, and 15 Eunomia.

You can choose any combination of the checkboxes to fully implement or ignore bright object avoidance when calculating visibility windows. This list of bright objects will be updated to be more comprehensive in subsequent SPOT releases. The visibility window will be adjusted to preclude times when your target coordinates are within 1 degree of the Earth (or Moon) or within 30 arcminutes of the objects on the 'Others' list.

To calculate your visibility windows to only avoid the Earth and Moon in your target field, check the Earth box and uncheck the Others box. Solar system observers planning to observe an object, or satellite of an object, on our bright moving object list (e.g. Neptune or Triton) may want to use this option. To calculate your visibility windows without taking the presence of bright objects in your target field into account, ensure that both the Earth and Others boxes are not checked.

9.7 Visibility Windows

9.7.1 General Information

The visibility windows function in SPOT is reached from the **Visibility/Orientation** button on the target entry dialog. The visibility dialog reports the windows when the selected target will be visible to SIRTF. If bright object avoidance (section 9.6) has been selected, any periods when a bright moving target will be in the field are deleted from the visibility window. The visibility/orientation dialog is shown in Figure 16.

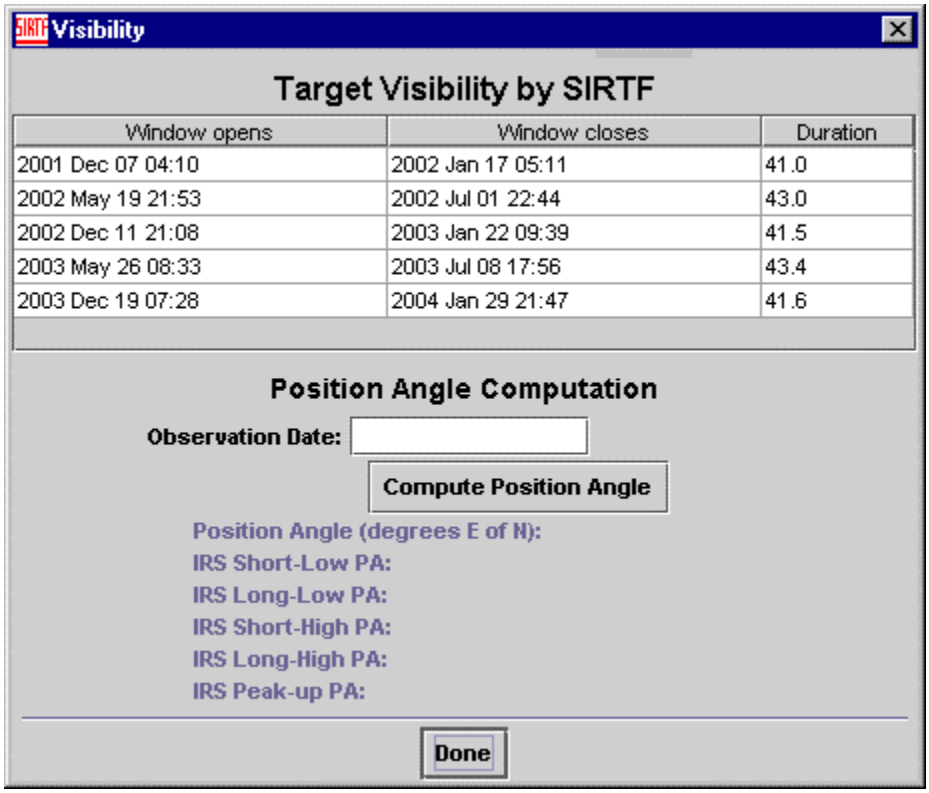

Figure 16: The Visibility/Orientation dialog that shows the windows when your target is visible. SPOT currently calculates visibility windows from December, 2001, through May, 2004.

9.7.2 Moving Object Visibility Information

After entering your NAIF ID or target name into the target entry window, select the level of bright object avoidance you would like SPOT to include (see section 9.6) when calculating the visibility of your target. If you are planning to observe any of the major planets or their satellites (except Pluto), you should uncheck the Others box for bright object avoidance. Then click on the Visibility/Orientation button in the upper right-hand quadrant of the target entry window. If SPOT has access to the ephemeris corresponding to the NAIF ID of your object it will now calculate the periods during which your object is visible to SIRTF. If bright object avoidance is selected, SPOT will modify the visibility windows to avoid times when a bright object is near your target object. A list is provided on the SIRTF Proposal Kit web page to help you determine which ephemerides are

already in the SSC database. The list includes the date on which the ephemeris files were generated.

If SPOT does not have access to the ephemeris corresponding to the NAIF ID of your object, a message will be returned requesting that you contact the Help Desk at sirtf@ipac.caltech.edu with the NAIF ID of the object you want to observe. We will add this ephemeris to our database and contact you when it is ready to use.

If your object does not have a NAIF ID and you are entering orbital elements for a user-defined ephemeris, please see section 9.4.2 for more information on how to get an ephemeris for visibility calculations.

9.7.3 SIRTF Planning with Horizons

For planning moving target observations, SPOT will return visibility windows for your target and provide time estimates for execution of your AORs. However, it does not have the capability to provide more specific geometric information required for planning some Solar System observations. To further assist planning your SIRTF observations with SPOT, the JPL Solar System Dynamics group has kindly incorporated the SIRTF orbit file into the publicly available JPL Horizons software (http://ssd.jpl.nasa.gov/horizons.html).

SIRTF can now be requested as an observatory within Horizons using the telnet and e-mail interfaces (SIRTF is NOT available as an observatory using the Horizons web interface). Horizons will return SIRTF-centered target positions and geometric information, such as maximum elongation of satellites from their parent planets. An illustrative step-by-step example showing how to use Horizons to generate SIRTF-centric information can be found on the Proposal Kit web page. Please consult the JPL Horizons User's Manual (http://ssd.jpl.nasa.gov/horizons_doc.html) for more detailed information on Horizons' capabilities and instructions for use.

9.8 Position Angle: Focal Plane and IRS Slits

Computing the position angle of the SIRTF focal plane can be done from the Visibility/Orientation dialog (shown in Figure 16). The position angle for a user-selected date is reported as the degrees east of celestial north of the SIRTF-to-sun vector projected onto the sky. The nominal field-of-view locations and the direction of the SIRTF-to-sun vector, projected onto the sky, are shown in Figure 17.

To determine a position angle, enter an acceptable date from the visibility window range into the Observation Date entry field and click on the Compute Position Angle button. SPOT will now return the Position Angle on the sky (degrees E of N) at your target on the specified date for the SIRTF focal plane. The position angles for the IRS slit modules and peak-up array are also reported. An IRAC map column and the MIPS in-scan direction run vertically in Figure 17. An IRAC map row and the MIPS cross-scan direction run horizontally.

If north is up and east is to the left in Figure 17, the position angle is 270°. You may enter

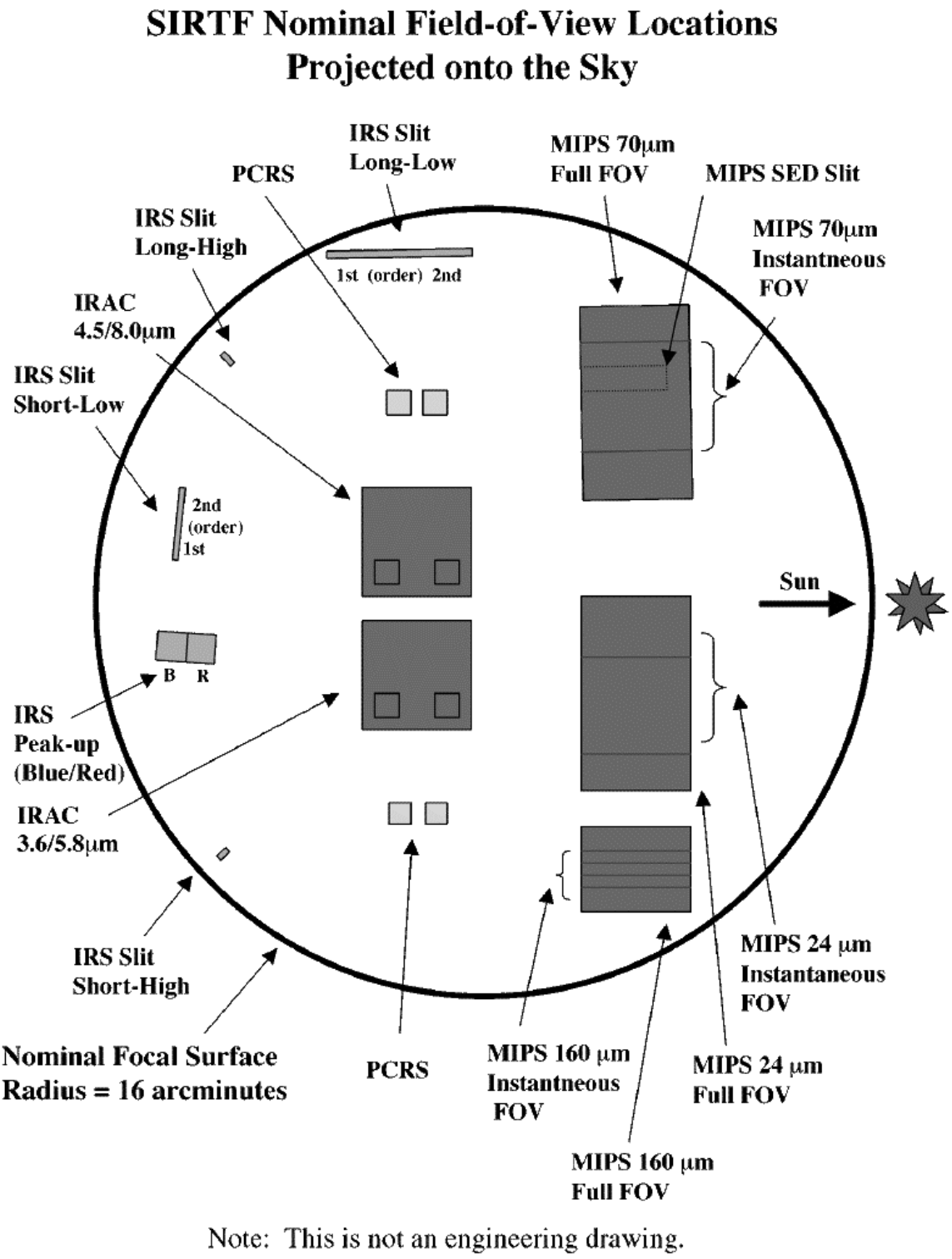

Figure 17: The SIRTF field-of-view locations projected onto the sky. The SIRTF-to-sun vector points to the right in this figure. The position angle that SPOT returns is the degrees east of north of this axis, projected onto the sky. If north is up in this figure, the position angle returned is 270 degrees. (The IRS Short Low module includes the 5.3-8.5 μm and 7.5-14.2 μm slits and the IRS Long Low module includes the 14.2-21.8 μm and 20.6-40.0 μm slits.)

the position angle that SPOT returns into IRSky (section 6.5.1) and display the SIRTF focal plane properly rotated on ISSA 12, 25, 60, or 100 micron maps of the sky. If north is up and the PA SPOT returns is zero, then Figure 17 rotates 90° counterclockwise.

9.9 Estimating the Sky Background

To plan your SIRTF observing program one of the important ingredients is the absolute brightness of the sky at the time of your observation. To judge the feasibility of detection of astronomical sources in the presence of strong foreground signals from the zodiacal light and interstellar cirrus, the observer requires knowledge of the background sky level relative to the astronomical source of interest. SIRTF provides two tools for estimating the sky background levels for your target.

9.9.1 IRSKY

If you are interested in the few arcminute-scale structure of the sky brightness, the best source is the IRAS sky maps, which you can obtain via the IRSky tool (section 6.5.1).

9.9.2 SPOT Background Estimate

If the observer is interested in the background on larger angular scales SPOT provides a background estimate. This is accessed via the Background button on the SPOT target entry dialog. *SPOT currently returns sky background estimates for inertial targets only.*

The Background Estimate dialog is shown in Figure 18. The observer enters the desired wavelength, and optionally a date and time. SPOT returns either minimum and maximum estimates of the background over the time period when the target is visible, if no date is entered, or an estimate for the specified date.

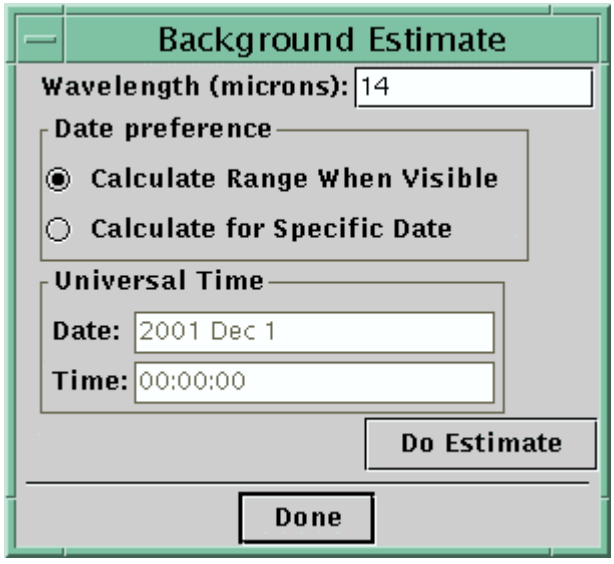

Figure 18: The SPOT Background Estimate dialog. The user enters the desired wavelength. If no date is entered, SPOT returns a minimum and maximum estimate of the background for the range of dates the target is visible. If a date is entered, SPOT calculates the estimate for the date and time.

Please see the **Estimating the Sky Background** memo on the SIRTF Proposal Kit web page for more information.

10 First-Generation Astronomical Observation Templates

The SIRTF Observer's Manual is your primary reference for information about using the SIRTF instruments and selecting appropriate AOT parameters. We provide some additional information for the individual AOTs here.

10.1 IRS Staring Mode

When calculating how much time you are spending on source, remember that IRS takes exposures at two positions along the slit as part of the standard data taking. You are spending twice as much time on source as the ramp duration you select. *In all of the IRS modes, do not check the Extended Source option if you select a PCRS peak-up. It is only available for IRS Peak-up.*

There are three modes available for use in the IRS Staring AOT.

10.1.1 Standard Staring

You can select any combination of slits in this mode and spectra are taken with each for your target position(s).

10.1.2 Step-and-Stare

The parameters for IRS step-and-stare let you select the number of positions in the direction parallel to the slit and the number of positions in the direction perpendicular to the slit. This is shown graphically in Figure 19. The upper part shows steps in the direction parallel to the slit. The lower part shows steps in the direction perpendicular to the slit. ***When specifying a step-and-stare map make sure that the products of the step sizes and the number of positions in the parallel and perpendicular directions are less than 1 degree. SPOT does not check this yet automatically.***

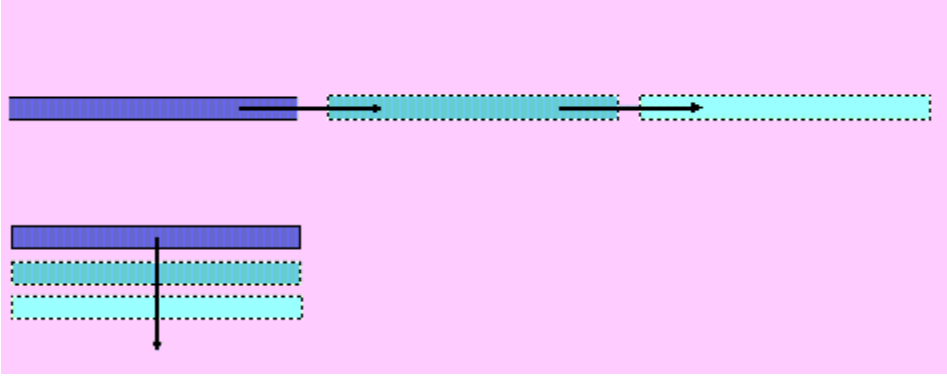

Figure 19: An illustration of IRS step-and-stare pattern directions. At the top it shows three positions in the direction parallel to the slit and at the bottom shows three positions in the direction perpendicular to the slit.

To determine the appropriate step-size for your step-and-stare observation, we list in Table 1 the slit lengths and widths. The maximum step size is one degree.

IRS SLIT	Slit Length	Slit Width
Hi Res 10-19.5 μm	12.1"	4.8"
Hi Res 19.3-37 μm	24.2"	9.7"
Low Res 5.3-8.5 μm	54.5"	3.6"
Low Res 7.5-14.2 μm	54.5"	3.6"
Low Res 14.2-21.8 μm	145.4"	9.7"
Low Res 20.6-40.0 μm	145.4"	9.7"

Table 1: The lengths and widths of the IRS Slits.

10.1.3 Peak-up Only

The Peak-up Only mode of IRS observing is designed to permit the user to test the feasibility of using a particular source as a peak-up target for future IRS observations. In instances where:

1. the available peak-up targets have a complex morphology,
2. the background is highly variable on small spatial scales, and
3. there is no nearby point source suitable for an offset peak-up,

it may be prudent to determine whether the onboard peak-up algorithm can successfully centroid on the target before investing large amounts of spectroscopic integration time on the science target(s) of interest.

This mode is only available for IRS peak-up, and only one peak-up only observation will be made per AOR. To select this mode, simply fill out the IRS peak-up section of the AOT (where the peak-up filter and accuracy are chosen) and then select Peak-up Only tab in the instrument section. The on-board, IRS peak-up software will run to completion, but no offset will be made to place a science target on one of the IRS slits. Two final images (one for the center and one for the array sweet-spot) are sent to the ground, as is the location of the peak-up target as found by the software in each image. The images are dark-subtracted, flat-fielded, and cosmic ray cleaned by the peak-up software.

The peak-up only mode does NOT return a time estimate in this version of SPOT. See section 12.1 for instructions on how to calculate the observing time required and enter it into your AOR file.

10.2 IRAC Mapping

10.2.1 Mapping versus Dithering

The terms mapping and dithering are used interchangeably by some observers, but in the IRAC Mapping AOT they mean the following:

- **Mapping**

The mapping dialog allows you to create a map on the sky with the grid laid out in either array coordinates or celestial coordinates. The hexagonal tile mapping option is not available. If you select the celestial coordinate orientation for your map, the orientation of the IRAC arrays on the sky will be determined by the position angle of the SIRTF focal plane at the time the observation is executed, but the map positions will be placed on a

celestial coordinate grid. In both cases you input the number of rows, columns, and the step sizes in arcseconds. The IRAC fields of view are arranged on the SIRTF focal plane in a column, one above the other (see Figure 17).

If both fields of view are selected for a map using ARRAY orientation, the map is done *once* with the map grid positions *centered between* the two IRAC fields of view.

If both fields of view are selected for a map using CELESTIAL orientation, the map is done *twice*, *once centered on each FOV*.

- **Dithering**

The IRAC AOT provides several dither pattern options. These are designed for small scale moves around your target positions. See the SIRTF Observer's Manual for details about the dither patterns. You may use both mapping and dithering at the same time, e.g. covering a large area of the sky with the mapping option and increasing your depth of coverage and resolution with a dither pattern.

10.2.2 Map Rows and Columns

Figure 20 illustrates the relationship between IRAC map rows and columns. It shows 1 row and 4 columns versus 4 rows and 1 column. The IRAC map columns are parallel to the MIPS in-scan direction and the IRAC map rows are parallel to the MIPS cross-scan direction. The IRAC map rows and MIPS cross-scan direction are both parallel to the SIRTF-to-sun vector, from which the position angle of the focal plane is reported by SPOT (see section 9.8).

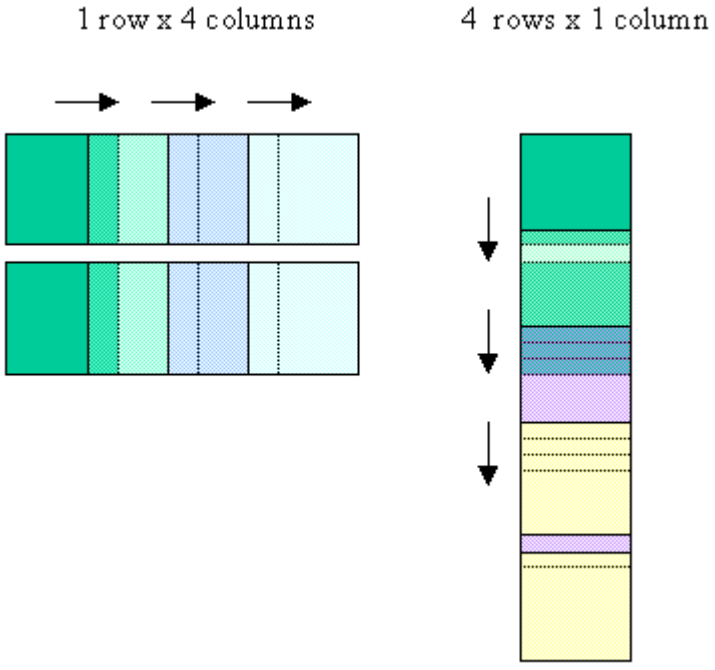

Figure 20: The relationship between rows and columns in the IRAC Mapping AOT is illustrated.

10.3 MIPS Scan Map

- **In-Scan versus Cross-Scan Directions**

The MIPS in-scan direction is parallel to the line along which the MIPS fields of view are nearly aligned in the SIRTF focal plane (Figure 17). This direction is also parallel to an IRAC column. The MIPS cross-scan direction is parallel to the SIRTF-to-sun direction.

- **160 μm Data Required checkbox**

The tool tip for this field should say that the meaning of this flag is "Schedule the observation when the telescope temperature is <= 5.5K." The 160μm data are always taken regardless of whether the flag is on or off. This flag is used to indicate that 160um data are a crucial part of this observation.

- **MIPS Scan 160μm data warnings**

SPOT currently warns you that the160μm field-of-view filling is uncertain for FAST scan rate scan legs of 3 degrees or longer. It should only give you this warning for scan legs 5 degrees or longer. See the MIPS chapter in the SIRTF Observer's Manual.

10.4 MIPS Photometry/Super Resolution

- **Raster Map: Rows vs. Columns**

A row in a MIPS PH/SR raster map is parallel to the MIPS cross-scan direction. A column is parallel to the MIPS in-scan direction. See Figure 17 for an illustration of the SIRTF focal plane projected onto the sky. In this figure a rows run horizontally and a columns run vertically. These are the same row/column definitions as IRAC mapping. Figure 21 illustrates the relationship of MIPS raster map rows and columns.

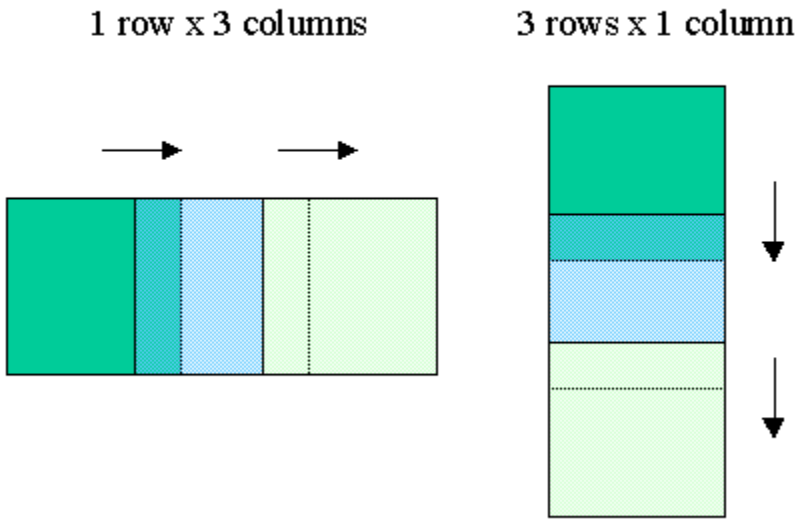

Figure 21: The relationship between rows and columns in the MIPS Photometry/Super Resolution AOT raster mapping mode is illustrated.

11 Second-Generation Astronomical Observation Templates

11.1 MIPS Spectral Energy Distribution and MIPS Total Power Mode

11.1.1 Overview

Though the MIPS SED and MIPS Total Power Mode AOTs will not be commissioned at launch, the AOT front-ends have been fully implemented in this version of SPOT. These observations can be specified in the same manner as the MIPS Scan and MIPS PH/SR AOTs. However, the SED and TPM AOTs are not implemented in AIRE, therefore no time estimates are returned in SPOT. The MIPS SED AOT is shown in Figure 22.

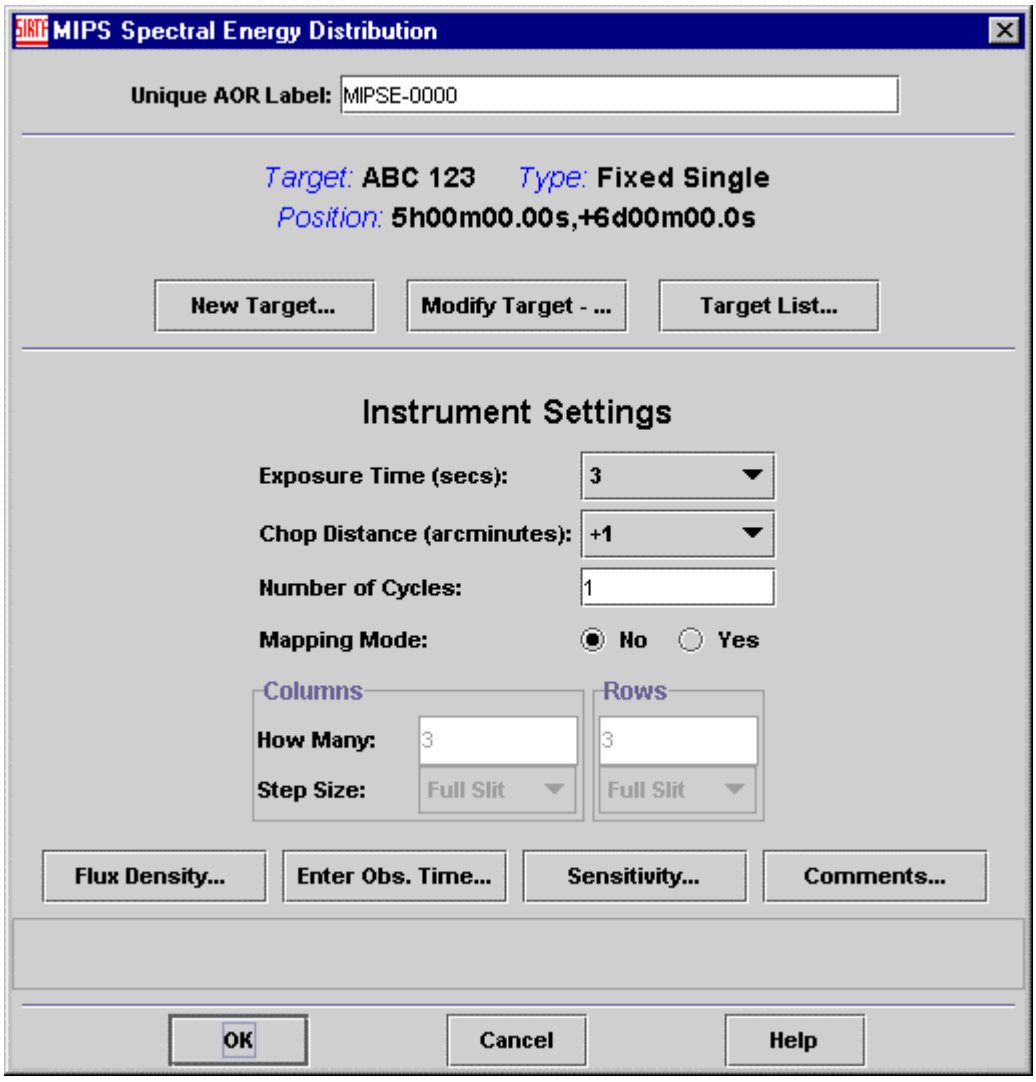

Figure 22: The MIPS Spectral Energy Distribution AOT is shown.

To calculate the observing time required for the MIPS SED and MIPS TPM AOTs you must consult the information provided on the SSC MIPS sensitivity web pages. There is a link to this information from the Proposal Kit web as well.

After you have calculated the wall-clock time, you enter this into the AOT form by clicking the Enter Obs. Time button at the bottom of the AOT. It takes the place of the Calc. Obs. Time button on the first-generation AOTs. The resource estimate dialog is now used as an input form where you enter the total AOR duration (wall-clock time) that you have calculated for this AOR. It is shown in Figure 23.

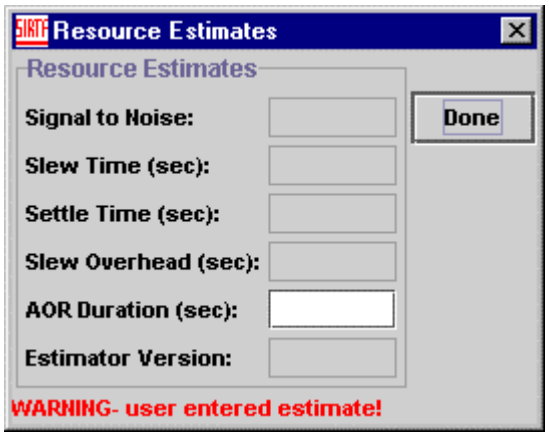

Figure 23: For the second-generation AOTs SPOT does not calculate a time estimate for the AOR. You must use the information provided on the web site to calculate the AOR Duration and then enter it into the AOT form.

11.1.2 Completing a MIPS SED or MIPS TPM AOT

In summary, to complete a MIPS Spectral Energy Distribution or MIPS Total Power Mode AOT, you follow these steps:

1. Complete the AOT template with the target and instrument information.
2. Use the information provided at the SSC web site to calculate the observing time required for the AOR.
3. Enter the observing time into the AOR Duration field using the Enter Obs. Estimate button on the AOT.
4. Save your AOR to disk.

11.2 IRS Spectral Mapping

11.2.1 Overview

The IRS Spectral Mapping AOT is partially implemented in this version of SPOT. You can use it to capture the information for your Spectral Mapping observations and to submit these AORs to the SSC. They will need to be modified in the future when the AOT front-end is fully implemented. The AOT form is shown in Figure 24.

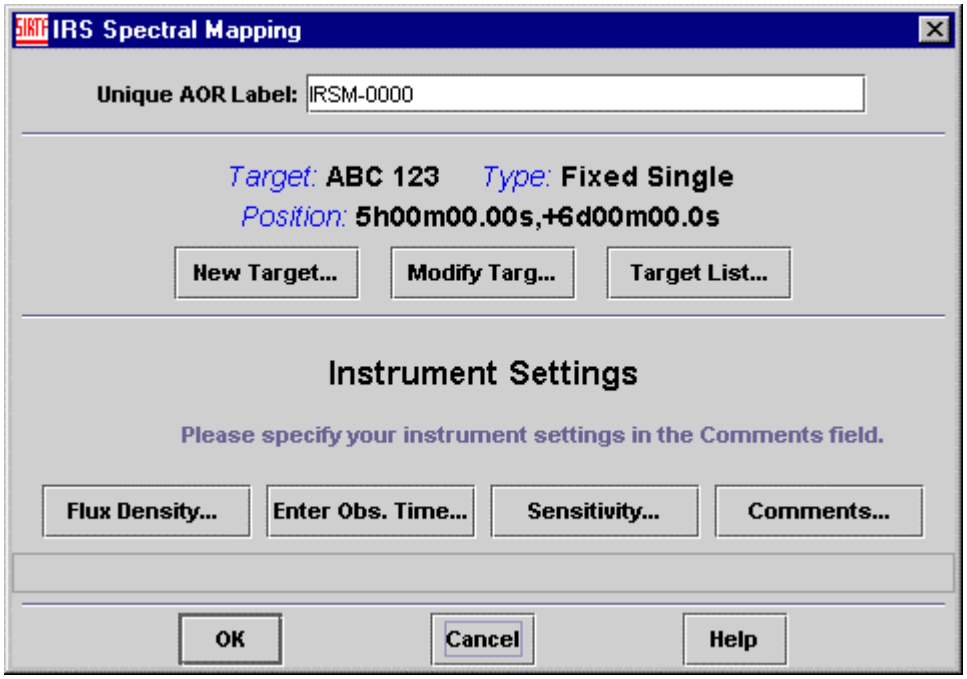

Figure 24: The IRS Spectral Mapping AOT is partially implemented in this version of SPOT.

The target information for a Spectral Mapping observation is entered in identical fashion to all of the other AOTs, but the AOT parameters (and peak-up, if desired) have to be entered into the comments field to capture the information specifying this observation. The keywords and parameters are provided in a file that you may download from the Proposal Kit web page. The contents of this file are shown in section 11.2.3.

11.2.2 Completing an IRS Spectral Mapping AOT

To complete an IRS Spectral Mapping AOT, you follow these steps:

1. Complete the AOT template with the target information.
2. From the SSC Proposal Kit web site download the Spectral Mapping parameters file. This file includes the keyword information that you use to specify the AOT parameters (see section 11.2.3).
3. Edit the parameters file for your observation.
4. Paste the contents of the parameters file into the comment field of your IRS Spectral Mapping AOT.

5. Use the information provided at the SSC web site to calculate the observing time required for the AOR.
6. Enter the observing time into the AOR Duration field using the Enter Obs. Estimate button on the AOT.
7. Save your AOR to disk.

11.2.3 IRS Spectral Mapping Parameters File

```
###   Peak-up Information
##        RA_OFFSET and DEC_OFFSET are in arcseconds
##        FLUX_DENSITY is in milliJanskys
#
# 1. Leave blank for default (no peak-up)
# 2. For IRS peak-up, edit this line and include it in the AOR
IRS_PEAK_UP:  OPTION=MODERATE, FILTER=BLUE, RA_OFFSET=5.0,
DEC_OFFSET=5.0, FLUX_DENSITY=1.0, EXTENDED=NO
# 3. For PCRS peak-up, edit this line and include it in the AOR
PCRS_PEAK_UP:  RA_OFFSET=5.0, DEC_OFFSET=5.0, FLUX_DENSITY=1.0
#
#
## Below the slits with parameters are listed. Only those desired
## for your observation should be included in the AOR.
#
HI_SHORT:  EXPOSURE_TIME=30, N_MAP_CYCLES=5, N_SCAN_LEGS=8,
SCAN_LEG_LENGTH=10, STEP_SIZE=1/2
HI_LONG:  EXPOSURE_TIME=60,  N__MAP_CYCLES=5, N_SCAN_LEGS=8,
SCAN_LEG_LENGTH=10, STEP_SIZE=1/2
LO_SHORT5:  EXPOSURE_TIME=6, N_MAP_CYCLES=2, N_SCAN_LEGS=4,
SCAN_LEG_LENGTH=4, STEP_SIZE=1/2
LO_SHORT7:  EXPOSURE_TIME=6, N__MAP_CYCLES=2, N_SCAN_LEGS=4,
SCAN_LEG_LENGTH=4, STEP_SIZE=1/2
LO_SHORT5_7:  EXPOSURE_TIME=6, N__MAP_CYCLES=2, N_SCAN_LEGS=4,
SCAN_LEG_LENGTH=4, STEP_SIZE=1/2
LO_LONG14:  EXPOSURE_TIME=14, N_MAP_CYCLES=1, N_SCAN_LEGS=4,
SCAN_LEG_LENGTH=4, STEP_SIZE=1/2
LO_LONG21:  EXPOSURE_TIME=14, N_MAP_CYCLES=1, N_SCAN_LEGS=4,
SCAN_LEG_LENGTH=4, STEP_SIZE=1/2
LO_LONG14_21:  EXPOSURE_TIME=14,  N_MAP_CYCLES=1, N_SCAN_LEGS=4,
SCAN_LEG_LENGTH=4, STEP_SIZE=1/2
#
###  SCAN_LEG_LENGTH is selected as integer multiples of the slit width
###  STEP_SIZE is selected as a fraction of  the slit length
###     (0, 1/4, 1/2, 3/4, full)
###  EXPOSURE TIME is in seconds, and must be selected from:
#
#    HI_LONG:  6, 14, 60, 240
#    HI_SHORT: 6, 30, 120, 480
#    LO_SHORT: 6, 14, 60, 240
#    LO_LONG:  6, 14, 30, 120
```

12 Special AOR Submission Instructions

SPOT is designed to create AOR files that you can submit directly to the SSC without having to edit the files by hand. There are two cases, though, that require special modification of the AOR file to include all the information needed for submittal. This is necessary because of features that haven't been fully implemented in the software.

12.1 IRS Peak-up Only AORs

12.1.1 Calculating the AOR Duration for Peak-up Only

The total duration time for a peak-up only observation may be estimated as follows.

$T_{Total} = T_{Slew} + T_C + T_{Peak\text{-}up}$

$T_{Peak\text{-}up}$ = peak-up time. This can take one of three values:

High Accuracy = 320 seconds
Moderate Accuracy = 160 seconds
Low Accuracy = 80 seconds

T_C = total command execution time, which in this case is 22 seconds.

T_{Slew} = initial slew overhead. This is currently 180 seconds.

Therefore, the total AOR Duration for your peak-up only observation is:

$T_{Total} = 202 + T_{Peak\text{-}up}$ seconds

12.1.2 Creating a Peak-up Only AOR

After you have created your IRS peak-up only AOR and calculated the time needed to execute the observation you will need to *edit the AOR file by hand* to include this information.

Below is what a peak-up only AOR would look like before you have edited the file.

```
#  DO NOT MODIFY OR DELETE THIS LINE --- FILE-VERSION:3.5: --- DO NOT
MOVE
#  Please edit this file with care to maintain the
#  correct format so that SPOT can still read it.
#  Generated by SPOT on:  4/25/2000     9:17:06

      AOT_TYPE:  IRS Staring
     AOR_LABEL:  IRS Peak-up Only

 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED SINGLE
   TARGET_NAME:  Test Target
```

```
  COORD_SYSTEM:  Equatorial  J2000
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
      POSITION:  RA=1h02m03.00s,  DEC=+4d05m06.0s

   IRS_PEAK_UP:  OPTION=MODERATE,  FILTER=BLUE,  RA_OFFSET=5.0",
DEC_OFFSET=10.0",  FLUX_DENSITY=3.2,  EXTENDED_SOURCE=NO
         MODE:  PEAK_UP_ONLY
```

This is a Moderate accuracy peak-up, so the total AOR duration is 202 + 160 = 362 seconds. To enter this into your AOR file you can paste in a resource estimate line from a completed AOR for which SPOT has written out the time estimate. In this example you edit this line so that the TOTAL_DURATION=362.0. The AOR is then ready to submit to the SSC. The above sample AOR, with the resource estimate line added and edited, is shown below.

```
#  DO NOT MODIFY OR DELETE THIS LINE --- FILE-VERSION:3.5: --- DO NOT
MOVE
#  Please edit this file with care to maintain the
#  correct format so that SPOT can still read it.
#  Generated by SPOT on:  4/25/2000     9:17:06

      AOT_TYPE:  IRS Staring
     AOR_LABEL:  IRS Peak-up Only

 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED SINGLE
   TARGET_NAME:  Test Target
  COORD_SYSTEM:  Equatorial  J2000
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
      POSITION:  RA=1h02m03.00s,  DEC=+4d05m06.0s

   IRS_PEAK_UP:  OPTION=MODERATE,  FILTER=BLUE,  RA_OFFSET=5.0",
DEC_OFFSET=10.0",  FLUX_DENSITY=3.2,  EXTENDED_SOURCE=NO
         MODE:  PEAK_UP_ONLY

RESOURCE_EST: TOTAL_DURATION=362.0, EXPOSURE_TIME= 0.0 , SLEW_TIME=0.,
SETTLE_TIME=0.0, SLEW_OVERHEAD=180, UPLINK_VOLUME=0, DOWNLINK_VOLUME=0,
VERSION=3.5 r. 1.31
```

After you have edited the AOR file, to make sure that there are no errors in it, read the AOR file into SPOT and display the resource estimates (by clicking the clock icon or selecting Show Current Resource Estimates from the Tools menu). If this is successful it should be ready to submit to the SSC.

12.2 Moving Cluster – Observe Offsets Only AORs

When you specify a moving cluster target in SPOT you can also check the box that says Observe Offsets Only. This means that SIRTF will use the ephemeris of the primary target for determining the telescope track but the primary target won't be one of the positions observed. Only the specified offset positions will be observed.

Though this feature is available on the SPOT front-end it is not yet implemented in the AIRE software that calculates the time estimates. Therefore, your time estimate will always include the primary position even if the Observe Offsets Only box is checked.

To submit an AOR with the correct positions, but also an appropriate time estimate, you need to calculate the time estimate with one less offset than you plan to observe and then edit the target to have all of the correct positions.

The process involves the following steps.

1. You first need to calculate a time estimate that only includes the number of positions you plan to observe. This means you need to fill out the moving cluster dialog *with one less offset than you actually plan to include* in your final moving cluster target. If you only plan on entering one offset, then you will have to create a moving single target to use to calculate the time estimate for your AOT.
2. Complete the AOT using the target created above and calculate a time estimate.
3. After you calculate the time estimate, but *before* clicking the OK button, select the MODIFY TARGET button. *You must modify the target from within the AOT.*
4. Edit the target to add the offset you left out in step 1, or if you had to create a moving single target to get the time estimate, you need to create a new moving cluster target from within the AOT.
5. Be sure the Observe Offsets Only box is checked in the moving cluster entry dialog.
6. Put a note in the Comment field in this AOR that you are planning to observe offsets only and have calculated the appropriate time.
7. Then, *without calculating the observing time again*, click OK.
8. Save the AOR to disk.

Normally, modifying the target after you have calculated the observing time, would result in an invalid AOR but the SSC will be prepared to deal with "Moving Cluster – Observe Offsets Only" AORs modified in this fashion.

13 The Duplication Tool

The Duplication Tool allows SPOT to automatically create a number of AORs by merging a ‘template’ AOR and a list of targets. For every target in your selected group, an AOR with the template parameters will be created.

To use the duplication tool:

1. First create the template AOR. Click on this AOR in the AOR table to make it the current AOR. It will be highlighted with a violet color to show that it is selected. All the AORs created with the duplication tool will have the AOT parameters specified in this AOR.

2. Select the Duplication Tool from the Tools menu.

3. Select the targets you wish to have merged with this template. You may do this in one of 3 ways.

- Open the current Target List from the Targets menu, the Target List icon, or the Target List button in the Duplication Tool Dialog. You may then drag-and-drop targets from the target list into the duplication tool window.

- From the duplication tool window you can select all of the targets in the Target List with the Get All Targets button.

- From the duplication tool window you can select the current target in the Target List with the Get Current button.

4. If you click Apply or OK, the new AORs will be created. Apply leaves the dialog open so that you can continue editing and do more duplications. OK creates the AORs and closes the dialog.

NOTE: If you click Apply and create your AORs and then click OK, SPOT will be asking if you want to create the duplicates AGAIN. To create just one set of duplicated AORs use OK when you are ready to duplicate them or click Apply followed by Cancel when you are finished.

14 Constraints Editing

14.1 Description

SPOT allows you to create TIMING and GROUPING constraints by selecting **Timing Constraints** or **Group/Follow-on Constraints** from the Tools menu. When you save your AORs, each timing constraint will be saved with the appropriate AOR and the grouping constraints will be written out at the end of the AOR file. *All constraints must be scientifically justified in your proposal for telescope time.* It is recommended that you complete all of your AORs before adding Grouping or Follow-on constraints that link them. This will lower the probability of your constraints becoming invalid due to changes made to the AORs included in the constraints.

14.2 Timing Constraints

Before entering a timing constraint *be sure to check that the target is visible to SIRTF during the planned timing window.* SPOT does not check this automatically yet. The target visibility windows are accessible from the target entry dialog via the Visibility/Orientation button (section 9.7). To enter a timing constraint, select an AOR from the AOR table and then select Timing Constraints from the Tools menu. The dialog shown in Figure 25 will appear. Then enter the start and end dates/times that define the window(s) when your observation should be made. All times should be entered as Universal Time (UT).

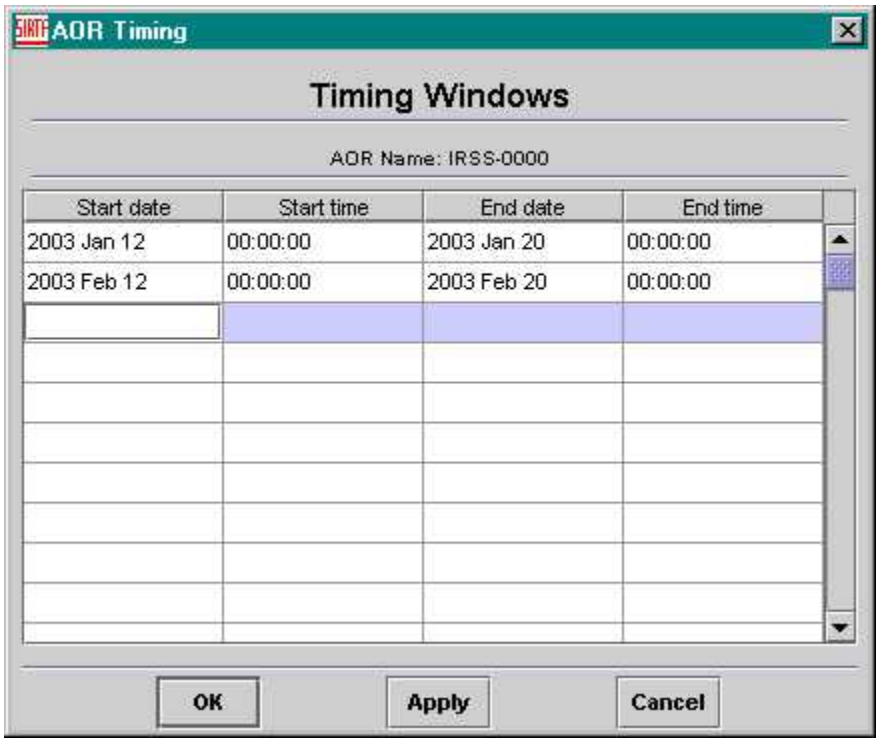

Figure 25: The Timing Windows dialog allows entry of multiple timing constraints for an AOR.

You also use this dialog to create ABSOLUTE TIME, BEFORE or AFTER constraints. For absolute time observations enter the same date and time for both the start and end fields. For a BEFORE constraint, enter the nominal SIRTF launch date for the start date/time and the date/time before which the observations should be done as the end time. For an AFTER constraint, enter the first date/time the observation should be done as the start time, and some distant date in the future for the end time. Some examples are shown in Table 2.

	Start_Date	Start_Time	End_Date	End_Time
Absolute Time:	2003 Jun 6	14:12:35	2003 Jun 6	14:12:35
Before Dec 1, 2003:	2001 Dec 1	00:00:00	2003 Dec 1	00:00:00
After June 3, 2002:	2002 Jun 4	00:00:00	2010 Dec 31	00:00:00

Table 2: Examples of Timing constraints that can be specified in the timing window.

When you have finished entering constraints if you click OK or Apply the **T** flag will be turned on in the main AOR table for this AOR. This is shown in Figure 26.
Clicking OK closes the Timing Window while clicking Apply leaves it open.

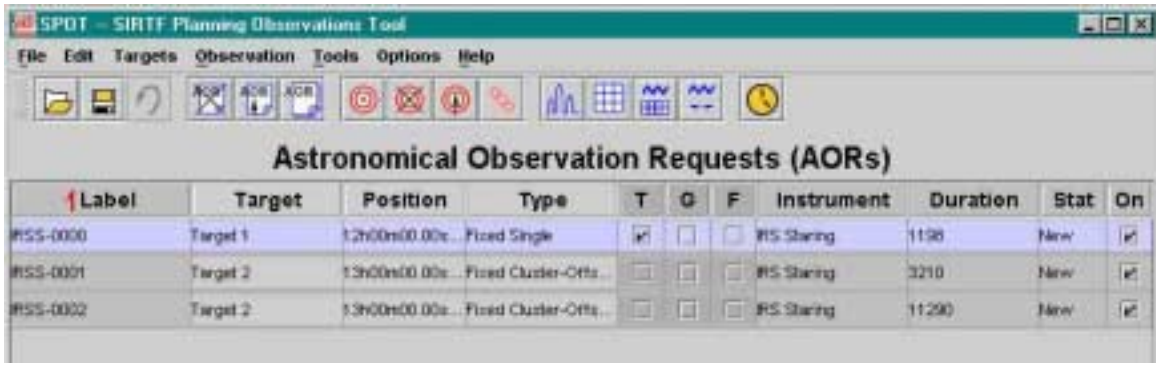

Figure 26: When a timing constraint has been added to an AOR, the 'T' flag will be turned on in the main AOR table.

You may also access the Timing Window from the Group/Follow-on Constraints dialog by clicking the Add Timing button. Grouping and Follow-on constraints are discussed in the next section.

14.3 Grouping/Follow-on Constraints

14.3.1 Description

You may create 3 types of grouping constraints: **Sequence**, **Chain**, and **Group Within**.

- **Sequence = ordered, interruptable group**. The AORs will be executed in the order specified, but may be interrupted by routine observatory activities, such as facility calibrations or downlinks.

- **Chain = ordered, non-interruptable group**. The AORs will be executed in the order specified with NO interruptions in the chain**.** ***If you chain together AORs you must ensure that the chain does not exceed*** *the maximum allowable duration for a single AOR (3 hours for MIPS, 6 hours for IRS and IRAC). See the Caveats section below.*

- **Group Within = A group of AORs executed within a specific length of time but with no particular starting date/time constraint.** Once the first AOR has been executed, the rest of the group will be completed within the specified time interval.

You may also create a constraint that requires an AOR to be executed at a specified time or specified interval after another AOR, but a specific timing window isn't required. This is called a Follow-on constraint.

- **Follow-on** = Execute the 'follow-on' AOR within a specified time range after a particular AOR has been executed.

14.3.2 Caveats for Grouping Constraints

The current implementation of constraints editing in SPOT allows you to specify the information required by the SSC to schedule your AORs with the required grouping or timing conditions. *However, this version of SPOT does NOT contain all of the required checks necessary to ensure that a constrained set of AORs can actually be executed by SIRTF*. You could create a series of constrained AORs that are simply not observable. More checks will be added in a future version of SPOT. See the SIRTF Observer's Manual and SIRTF Policies documents for more information and if you are still in doubt, send a message to the Help Desk (sirtf@ipac.caltech.edu). Three guidelines for groups that are not allowed are:

1. SIRTF operates only one instrument at a time and it takes a finite amount of time to switch from one instrument to another. Do not create non-interruptable grouping constraints (chains) that include AOTs from multiple instruments.

2. The maximum allowable duration for a non-interruptable group (chain) of AORs is 3 hours for MIPS and 6 hours for IRS or IRAC. Total up the AOR durations for your chain to ensure that it will fit within these time limits.

3. If you create a Group Within constraint you must check that the sum of the AOR durations in the constraint does not exceed the time period specified in the constraint.

14.3.3 Creating New Grouping and Follow-on Constraints

To create a new constraint select **Group/Follow-on Constraints** from the Tools menu. This opens the constraints dialog shown in Figure 27. To add a new grouping constraint you click on the **Add Sequencing**, **Add Chaining** or **Add Group-Within** buttons.

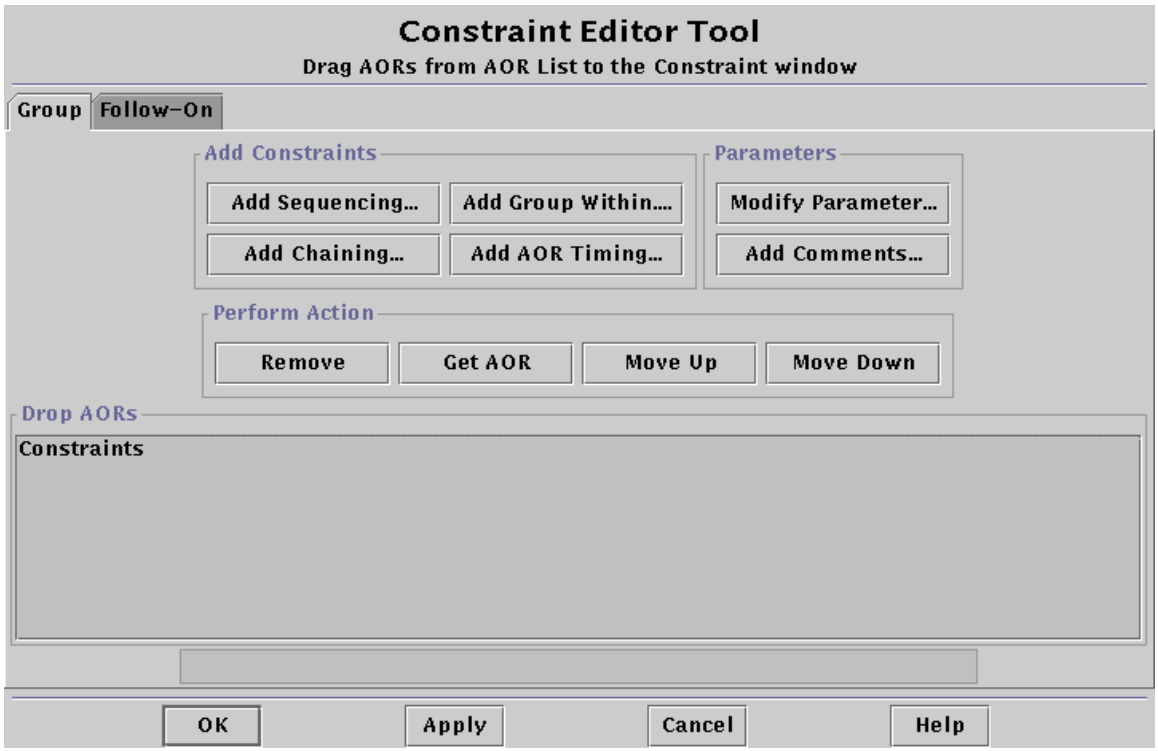

Figure 27: The constraint editor dialog is the tool used to add grouping and follow-on constraints.

If you choose to add a new Sequence constraint SPOT opens the dialog shown in Figure 28 with the default name “Sequence-0000”. You may edit this or just click OK.

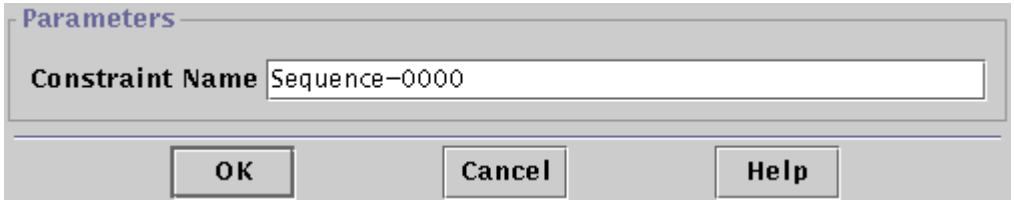

Figure 28: The dialog for creating a Sequence constraint, an ordered interruptable group. This is opened from the Add Sequencing button in the constraint editor dialog.

SPOT uses the name for each constraint to identify it and lists the constraints by name when you write out your AOR file. If you selected Chain or Group-Within constraints instead of Sequence, SPOT will open the dialogs shown in Figure 29 and Figure 30, respectively. When you click OK, SPOT adds the newly created constraint to the constraint dialog, shown in Figure 31.

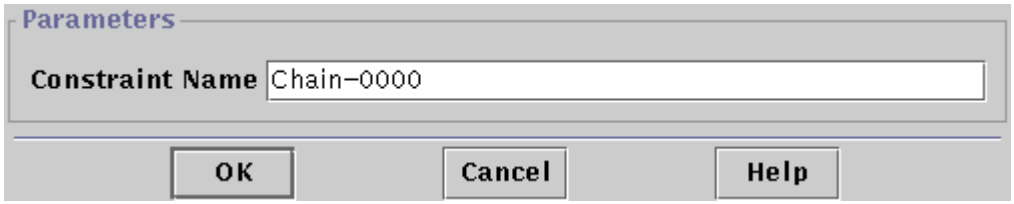

Figure 29: The dialog for creating a 'Chain' constraint, an ordered non-interruptable group. This is opened from the 'Add Chaining' button in the constraint editor dialog.

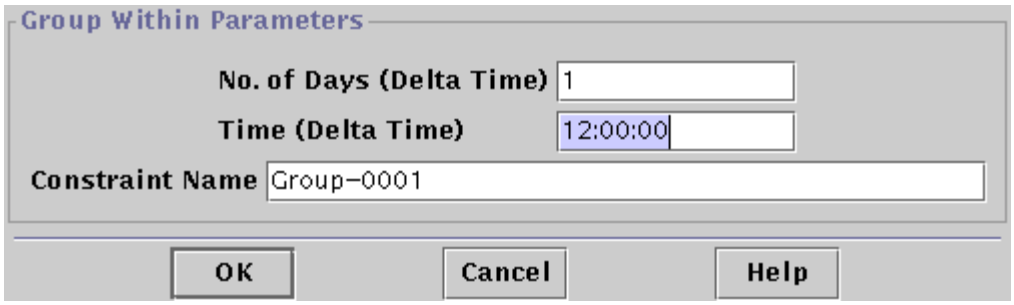

Figure 30: The dialog for creating a Group-Within constraint is opened from the constraint editor dialog by clicking the Add Group Within button. In this example the AORs will be executed within a 36 hour time period, specified as one day plus 12 hours. You must check to make sure the total duration of your AORs does not exceed the amount of time you select in the constraint.

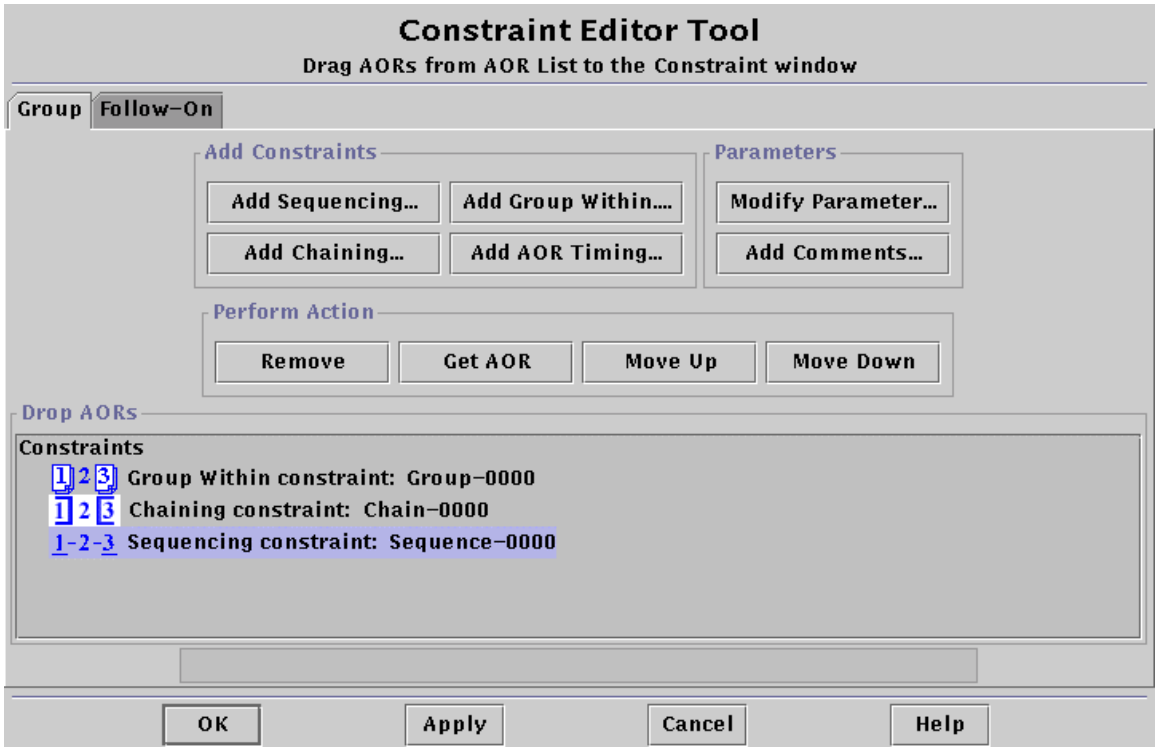

Figure 31: The constraint editor dialog with 3 new constraints added. No AORs have been linked to these constraints yet.

14.3.4 Linking AORs to a Grouping Constraint

After creating the Sequence, Chain, or Group-Within constraint you are ready to specify which AORs are included in this constraint. There are two methods for doing this:

1. Drag-and-drop: In the main AOR table, click on the desired AOR and keep the mouse button pressed, drag your cursor to the appropriate constraint name in the constraints dialog, and release the cursor to add the AOR to the constraint. Repeat this process to add additional AORs. *Drag-and-drop does not work if you are using a Linux operating system with this version of SPOT. Use the 'Get AOR button' method below to link AORs to the constraint.*

2. Get AOR button: First click on the constraint to which you want to add AORs. Next, in the AOR table, click on the AOR you want to link to the constraint. Then click the Get AOR button in the 'Perform Actions' section of the constraints dialog (see Figure 32) to add the AOR to the constraint. Repeat the process to link additional AORs to the constraint.

After linking four AORs to the Sequence-0000 constraint the constraint dialog will look like Figure 32.

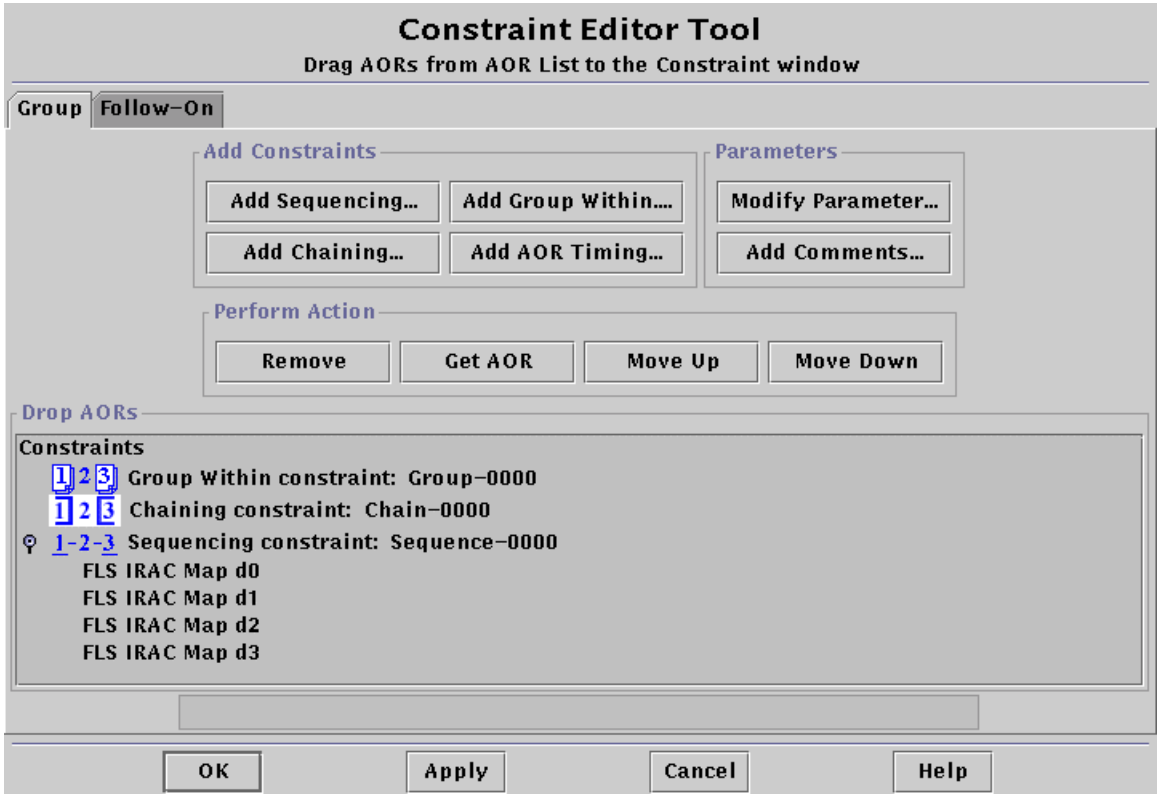

Figure 32: After linking four AORs to the Sequence-0000 constraint, the constraint editor will look like this. You can manipulate the order of the AORs by selecting one and using the Perform Action buttons to Remove the AOR or move it up or down in the order.

14.3.5 Creating a Follow-on Constraint

Follow-on constraints are used when the execution of one AOR needs to trigger the execution of a second AOR at a particular time or with a particular time delay. A circumstance where this might commonly be used is if you are doing a test peak-up observation with IRS and you don't want to execute the IRS spectral science observation until you have been able to confirm that the peak-up will be successful. The peak-up only observation would go first and the peak-up plus spectrum observation would be linked to it with a follow-on constraint.

A more complicated hypothetical example of how to use a follow-on constraint is described below. Assume you want to take observations of an object with some periodic behavior and you want spectra at two different phases in the cycle. In this example 'phase 1' occurs every 10.5 days and lasts for 8 hours, and after the first observation is made you want to capture 'phase 2' 36-72 hours later. To do this you would create the 2 AORs that you want to link and use the following steps to apply the constraints.

Use the timing constraint discussed in section 14.2 to constrain the first phase. In Figure 33 we show 3 timing windows that would capture phase 1 every 10.5 days with an 8-hour window.

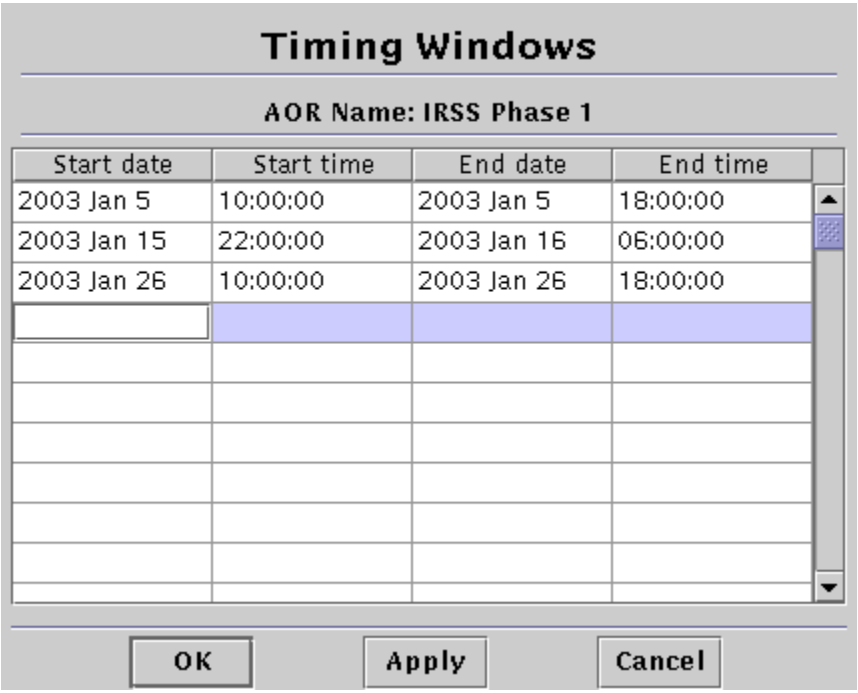

Figure 33: Three timing windows that provide an 8-hour window every 10.5 days to observe a particular phase of a hypothetical periodic object.

After applying the timing constraint to the 'phase 1' observation, the main AOR should look like Figure 34. The timing constraint flag is automatically checked to show that the timing constraint has been created.

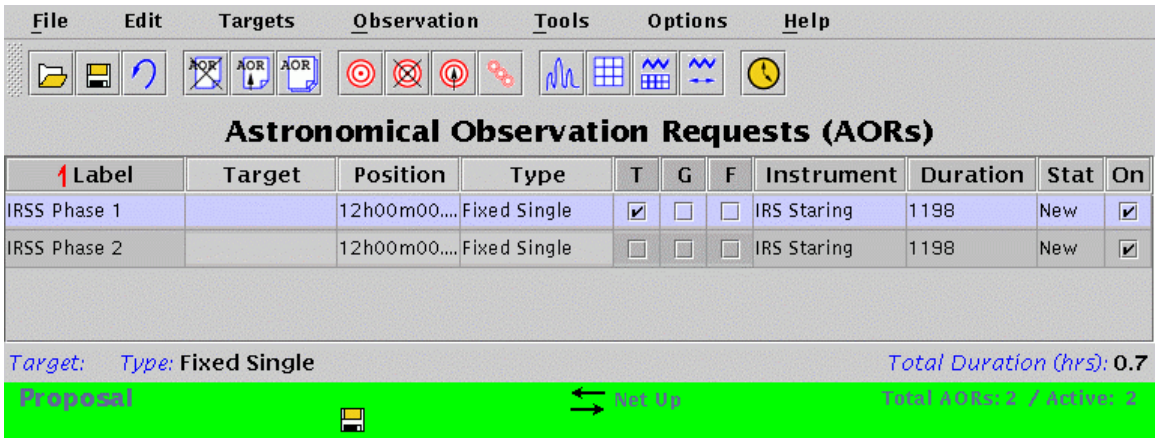

Figure 34: The main AOR table is shown after adding timing constraints to the first AOR in the follow-on example. The timing 'T' flag is on.

To create the follow-on portion of the constraint select the Follow-on tab in the constraints dialog. This is shown in Figure 35.

Figure 35: The follow-on section of the constraint editor dialog is shown. Click 'Add Follow On' to create a new constraint.

Then click the Add Follow-on button that opens the dialog shown in Figure 36. The default name is FollowOn-0000 and the parameters here constrain the phase 2 observation to be executed between 36 hours (1 day + 12 hours) and 72 hours (3 days) after the phase 1 observation is executed.

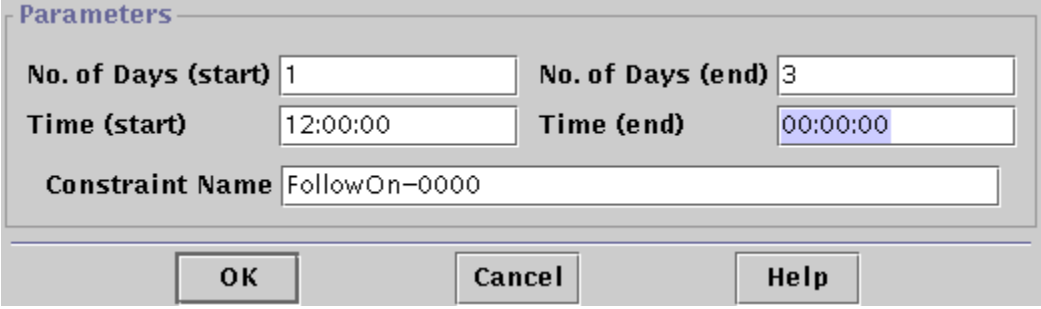

Figure 36: Enter the parameters for a new follow-on constraint in this dialog. The default name is FollowOn-0000 and the parameters here constrain the phase 2 observation to be executed between 36 hours (1 day + 12 hours) and 72 hours (3 days) after the phase 1 observation is executed.

After clicking OK to create the constraint, link the two AORs from the AOR table using either drag-and-drop or the Get AOR button as described in section 14.3.4. The resulting constraint should look like Figure 37. *Check to make sure the AORs are in the correct order, with the first AOR to be executed going first in the list.* If they are in the wrong order, select one and use the Perform Action buttons (see Figure 35) to reorder them.

Figure 37: The phase 1 and phase 2 observations included in the follow-on example are shown when linked to the constraint. The FIRST AOR in the list is executed and followed by the SECOND AOR according to the timing specified in the constraint.

After clicking OK or Apply, the main AOR table will look like Figure 38. Both AORs now have the follow-on F flags turned on. SPOT uses the T, G, and F flags to report the status of constraints. You can't manipulate the flags directly even though they look like check-boxes.

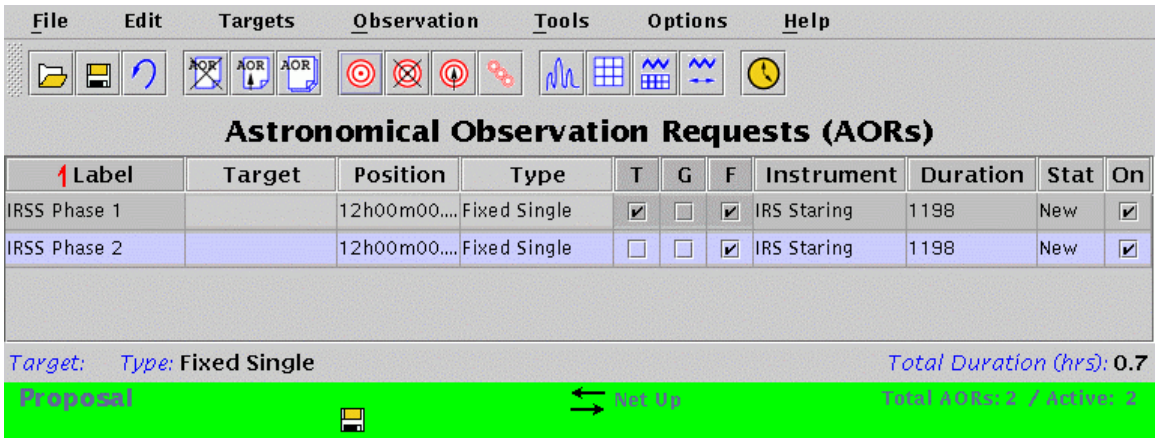

Figure 38: After adding the follow-on constraint, the AOR table looks like this figure. Both AORs have the follow-on 'F' flag turned on. You cannot manipulate the T, G, and F flags directly. SPOT uses them to report the existence of constraints.

15 Sample SPOT Target File

In this section we provide a sample target file that includes an example of every coordinate type/target type combination that can be created with SPOT. These are not real astronomical targets. They are random positions used to illustrate the correct format for SPOT targets if you are using a text editor to create a target file. The target list window from SPOT for these targets is shown in Figure 39. This SPOT target file is called SPOT_3_5.tgt and can be downloaded from the SSC Proposal Kit page.

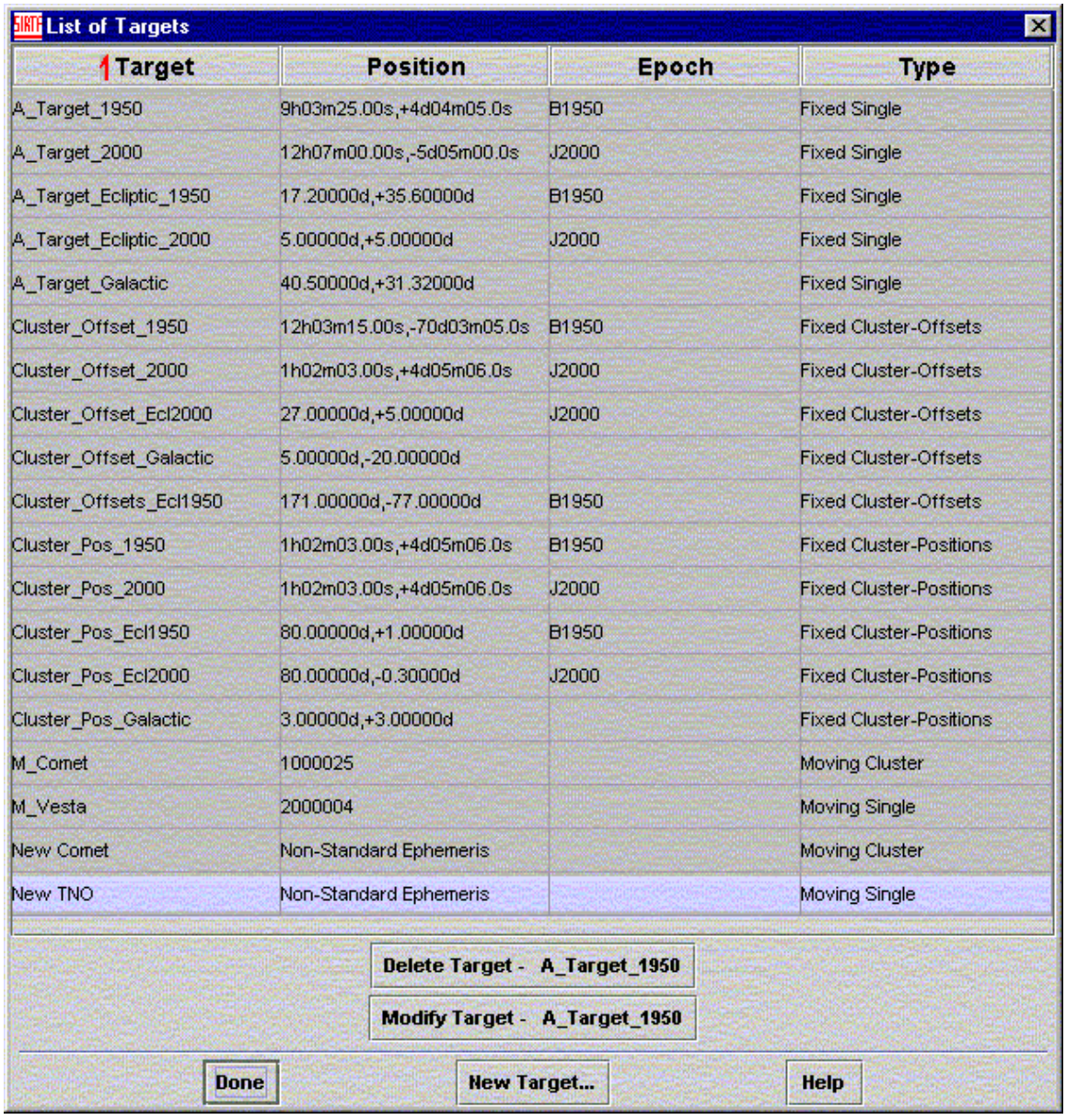

Figure 39: The target list for the example targets in the SPOT target file called SPOT_3_5.tgt. This file can be downloaded from the Proposal Kit web page.

```
######  File:  SPOT_3_5.tgt.

#  This file contains examples of each type of target that
#  can be created with SPOT. For the most part these are NOT real
#  astronomical objects.  They simply illustrate what the format and
#  parameters in the target files are.

#####   Inertial Targets
#     Fixed Single - Equatorial  J2000
#     Fixed Single - Equatorial  B1950
#     Fixed Single - Galactic
#     Fixed Single - Equatorial  J2000
#     Fixed Single - Equatorial  B1950
#     Fixed Cluster - Positions - Equatorial  J2000
#     Fixed Cluster - Positions - Equatorial  B1950
#     Fixed Cluster - Positions - Galactic
#     Fixed Cluster - Positions - Equatorial  J2000
#     Fixed Cluster - Positions - Equatorial  B1950

#####   Moving Targets
#     Moving Single - NAIF ID
#     Moving Single - User Defined Ephemeris
#     Moving Cluster - NAIF ID
#     Moving Cluster - User Defined Ephemeris


 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED SINGLE
   TARGET_NAME:  A_Target_1950
  COORD_SYSTEM:  Equatorial  B1950
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
      POSITION:  RA=9h03m25.00s,  DEC=+4d04m05.0s, PM_RA=-2.35",
PM_DEC=12.6", EPOCH=1970.0


 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED SINGLE
   TARGET_NAME:  A_Target_2000
  COORD_SYSTEM:  Equatorial  J2000
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
      POSITION:  RA=12h07m00.00s,  DEC=-5d05m00.0s, PM_RA=3.5",
PM_DEC=4.21"


 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED SINGLE
   TARGET_NAME:  A_Target_Ecliptic_1950
  COORD_SYSTEM:  Ecliptic  B1950
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
      POSITION:  RA=17.20000d,  DEC=+35.60000d, EPOCH=1950.0


 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED SINGLE
   TARGET_NAME:  A_Target_Ecliptic_2000
```

```
  COORD_SYSTEM:  Ecliptic  J2000
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
      POSITION:  RA=5.00000d,  DEC=+5.00000d


 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED SINGLE
   TARGET_NAME:  A_Target_Galactic
  COORD_SYSTEM:  Galactic
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
      POSITION:  RA=40.50000d,  DEC=+31.32000d

 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED CLUSTER - OFFSETS
   TARGET_NAME:  Cluster_Offset_1950
  COORD_SYSTEM:  Equatorial  B1950
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
     POSITION1:  RA=12h03m15.00s,  DEC=-70d03m05.0s, PM_RA=2.0",
PM_DEC=-4.0", EPOCH=1950.0
     OFFSET_P2:  RA=3.0",     DEC=-1.0"
     OFFSET_P3:  RA=4.0",     DEC=-3.0"
     OFFSET_P4:  RA=5.0",     DEC=-2.0"
     OFFSET_P5:  RA=6.0",     DEC=-4.0"


 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED CLUSTER - OFFSETS
   TARGET_NAME:  Cluster_Offset_2000
  COORD_SYSTEM:  Equatorial  J2000
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
     POSITION1:  RA=1h02m03.00s,  DEC=+4d05m06.0s, PM_RA=3.0",
PM_DEC=2.0"
     OFFSET_P2:  RA=10.0",    DEC=-10.0"
     OFFSET_P3:  RA=20.0",    DEC=-20.0"
     OFFSET_P4:  RA=30.0",    DEC=-30.0"


 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED CLUSTER - OFFSETS
   TARGET_NAME:  Cluster_Offset_Ecl2000
  COORD_SYSTEM:  Ecliptic  J2000
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
     POSITION1:  RA=27.00000d,  DEC=+5.00000d
     OFFSET_P2:  RA=1200.0",  DEC=2000.0"
     OFFSET_P3:  RA=1200.0",  DEC=3000.0"
     OFFSET_P4:  RA=1200.0",  DEC=3600.0"


 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED CLUSTER - OFFSETS
   TARGET_NAME:  Cluster_Offset_Galactic
  COORD_SYSTEM:  Galactic
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
     POSITION1:  RA=5.00000d,  DEC=-20.00000d
     OFFSET_P2:  RA=300.0",   DEC=400.0"
     OFFSET_P3:  RA=400.0",   DEC=500.0"
     OFFSET_P4:  RA=1000.0",  DEC=1000.0"
```

```
 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED CLUSTER - OFFSETS
   TARGET_NAME:  Cluster_Offsets_Ecl1950
  COORD_SYSTEM:  Ecliptic  B1950
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
     POSITION1:  RA=171.00000d,  DEC=-77.00000d, EPOCH=1960.3
     OFFSET_P2:  RA=100.0",   DEC=200.0"
     OFFSET_P3:  RA=300.0",   DEC=400.0"
     OFFSET_P4:  RA=500.0",   DEC=600.0"


 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED CLUSTER - POSITIONS
   TARGET_NAME:  Cluster_Pos_1950
  COORD_SYSTEM:  Equatorial  B1950
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
     POSITION1:  RA=1h02m03.00s, DEC=+4d05m06.0s, PM_RA=7.0",
PM_DEC=8.0", EPOCH=1950.0
     POSITION2:  RA=1h02m12.00s, DEC=+3d10m07.0s, PM_RA=3.0",
PM_DEC=3.0", EPOCH=1950.0
     POSITION3:  RA=1h02m25.00s, DEC=+3d20m07.0s, PM_RA=-2.0", PM_DEC=-
2.0", EPOCH=1950.0
     POSITION4:  RA=1h02m06.00s, DEC=+3d50m12.0s, PM_RA=-2.0", PM_DEC=-
2.0", EPOCH=1950.0


 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED CLUSTER - POSITIONS
   TARGET_NAME:  Cluster_Pos_2000
  COORD_SYSTEM:  Equatorial  J2000
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
     POSITION1:  RA=1h02m03.00s, DEC=+4d05m06.0s, PM_RA=3.0",
PM_DEC=4.0"
     POSITION2:  RA=1h02m15.00s, DEC=+4d01m03.0s, PM_RA=5.0",
PM_DEC=6.0"
     POSITION3:  RA=1h02m30.00s, DEC=+3d50m03.0s, PM_RA=2.0",
PM_DEC=1.0"


 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED CLUSTER - POSITIONS
   TARGET_NAME:  Cluster_Pos_Ecl1950
  COORD_SYSTEM:  Ecliptic  B1950
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
     POSITION1:  RA=80.00000d, DEC=+1.00000d, EPOCH=1950.0

     POSITION2:  RA=80.10000d, DEC=+1.00000d, EPOCH=1950.0

     POSITION3:  RA=80.20000d, DEC=+1.00000d, EPOCH=1950.0

     POSITION4:  RA=80.30000d, DEC=+1.00000d, EPOCH=1950.0
```

```
 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED CLUSTER - POSITIONS
   TARGET_NAME:  Cluster_Pos_Ecl2000
  COORD_SYSTEM:  Ecliptic  J2000
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
     POSITION1:  RA=80.00000d, DEC=-0.30000d
     POSITION2:  RA=80.00000d, DEC=-0.10000d
     POSITION3:  RA=80.00000d, DEC=+0.10000d
     POSITION4:  RA=80.00000d, DEC=+0.30000d


 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED CLUSTER - POSITIONS
   TARGET_NAME:  Cluster_Pos_Galactic
  COORD_SYSTEM:  Galactic
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
     POSITION1:  RA=3.00000d, DEC=+3.00000d
     POSITION2:  RA=3.10000d, DEC=+3.00000d
     POSITION3:  RA=3.20000d, DEC=+3.00000d
     POSITION4:  RA=3.30000d, DEC=+3.00000d

 MOVING_TARGET:  YES
   TARGET_TYPE:  MOVING CLUSTER
   TARGET_NAME:  M_Comet
     EPHEMERIS:  NAIF_ID=1000025, NAIF_NAME=Encke
OBSERVE_OFFSETS_ONLY:  NO
 OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
       OFFSET1:  RA=10.0",    DEC=20.0"
       OFFSET2:  RA=20.0",    DEC=30.0"
       OFFSET3:  RA=-10.0",   DEC=-10.0"
       OFFSET4:  RA=-20.0",   DEC=-20.0"

 MOVING_TARGET:  YES
   TARGET_TYPE:  MOVING SINGLE
   TARGET_NAME:  M_Vesta
     EPHEMERIS:  NAIF_ID=2000004, NAIF_NAME=Vesta
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = NO

 MOVING_TARGET:  YES
   TARGET_TYPE:  MOVING CLUSTER
   TARGET_NAME:  New Comet
     EPHEMERIS:  EPOCH=2452160.5, T=2452167.2, LITTLE_OMEGA=343.37,
BIG_OMEGA=75.42, ECCENTRICITY=0.6238958, PERIHELION-DISTANCE=1.3582,
INCLINATION-OF-ORBIT=4.51
OBSERVE_OFFSETS_ONLY:  YES
 OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
       OFFSET1:  RA=5.0",     DEC=-5.0"
       OFFSET2:  RA=6.0",     DEC=-3.0"

 MOVING_TARGET:  YES
   TARGET_TYPE:  MOVING SINGLE
   TARGET_NAME:  New TNO
     EPHEMERIS:  EPOCH=2451325.5, T=245013l.5, LITTLE_OMEGA=281.13,
BIG_OMEGA=78.84, ECCENTRICITY=0.3154067, PERIHELION-DISTANCE=8.1598,
INCLINATION-OF-ORBIT=5.96
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = NO
```

16 Sample AOR File

In this section we provide a sample AOR file that includes examples of the format SPOT uses in AOR files. These do not use real astronomical targets nor do they purport to show scientifically useful observations. They are here to illustrate the format of the AOR files and the necessary parameters. In future versions of this User's Guide we will replace these with scientifically more interesting examples. This AOR file is called SPOT_3_5.aor and can be downloaded from the SSC Proposal Kit page.

```
#  DO NOT MODIFY OR DELETE THIS LINE --- FILE-VERSION:3.5: --- DO NOT
MOVE
#  Please edit this file with care to maintain the
#  correct format so that SPOT can still read it.
#  Generated by SPOT on:  4/25/2000     9:22:31

AOT_TYPE:  IRAC Mapping
     AOR_LABEL:  IRAC Map

 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED SINGLE
   TARGET_NAME:  A_Target_Galactic
  COORD_SYSTEM:  Galactic
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
      POSITION:  RA=40.50000d,  DEC=+31.32000d

          READOUT_MODE: FULL_ARRAY
                 ARRAY: 3.6_5.8u=YES, 4.5_8.0u=YES
            HI_DYNAMIC: NO
            FRAME_TIME: 12.0
        DITHER_PATTERN: TYPE=cycling, N_POSITION=5, START_POINT=1
          DITHER_SCALE: large
 N_FRAMES_PER_POINTING: 1
MAP: TYPE=RECTANGULAR, ROWS=5, COLS=5, ROW_STEP=260.0, COL_STEP=260.0,
     ORIENT=ARRAY, N_CYCLE=1

RESOURCE_EST: TOTAL_DURATION=3572.4, EXPOSURE_TIME= 0.0 ,
SLEW_TIME=888.4, SETTLE_TIME=620.0, SLEW_OVERHEAD=180,
UPLINK_VOLUME=6128, DOWNLINK_VOLUME=65792000, VERSION=3.5 r. 1.31
COMMENT_START:
Enter comments here.


COMMENT_END:
```

```
      AOT_TYPE:  IRAC Mapping
     AOR_LABEL:  IRAC Map HDR- celestial

 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED SINGLE
   TARGET_NAME:  A_Target_Galactic
  COORD_SYSTEM:  Galactic
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
      POSITION:  RA=40.50000d,  DEC=+31.32000d

          READOUT_MODE: FULL_ARRAY
                 ARRAY: 3.6_5.8u=YES, 4.5_8.0u=YES
            HI_DYNAMIC: YES
            FRAME_TIME: 12.0
        DITHER_PATTERN: TYPE=FullFixed5
          DITHER_SCALE: large
 N_FRAMES_PER_POINTING: 1
MAP: TYPE=RECTANGULAR, ROWS=5, COLS=5, ROW_STEP=260.0, COL_STEP=260.0,
     ORIENT=CELESTIAL, ANGLE=40.0, N_CYCLE=1

RESOURCE_EST: TOTAL_DURATION=8545.4, EXPOSURE_TIME= 0.0 ,
SLEW_TIME=1953.4, SETTLE_TIME=1250.0, SLEW_OVERHEAD=180,
UPLINK_VOLUME=22576, DOWNLINK_VOLUME=394752000, VERSION=3.5 r. 1.31
COMMENT_START:
Enter comments here.
COMMENT_END:
```

```
      AOT_TYPE:  IRAC Mapping
     AOR_LABEL:  IRAC subarray

 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED SINGLE
   TARGET_NAME:  A_Target_Galactic
  COORD_SYSTEM:  Galactic
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
      POSITION:  RA=40.50000d,  DEC=+31.32000d

          READOUT_MODE: SUBARRAY
                 ARRAY: 36u=YES, 58u=YES, 45u=YES, 80u=YES
            HI_DYNAMIC: NO
            FRAME_TIME: 0.1
        DITHER_PATTERN: TYPE=SubFixed1
          DITHER_SCALE: large
 N_FRAMES_PER_POINTING: 1

RESOURCE_EST: TOTAL_DURATION=499.1, EXPOSURE_TIME= 0.0 ,
SLEW_TIME=72.1, SETTLE_TIME=75.0, SLEW_OVERHEAD=180, UPLINK_VOLUME=944,
DOWNLINK_VOLUME=2105344, VERSION=3.5 r. 1.31
COMMENT_START:
Enter comments here.
COMMENT_END:
```

```
      AOT_TYPE:  IRS Staring
     AOR_LABEL:  IRS Peak-up Only

 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED SINGLE
   TARGET_NAME:  Test Target
  COORD_SYSTEM:  Equatorial  J2000
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
      POSITION:  RA=1h02m03.00s,  DEC=+4d05m06.0s

   IRS_PEAK_UP:  OPTION=MODERATE,  FILTER=BLUE,  RA_OFFSET=5.0",
DEC_OFFSET=10.0",  FLUX_DENSITY=3.2,  EXTENDED_SOURCE=NO
          MODE:  PEAK_UP_ONLY

RESOURCE_EST: TOTAL_DURATION=362.0, EXPOSURE_TIME= 0.0 , SLEW_TIME=0.0,
SETTLE_TIME=0.0, SLEW_OVERHEAD=180, UPLINK_VOLUME=0, DOWNLINK_VOLUME=0,
VERSION=3.5 r. 1.31



      AOT_TYPE:  IRS Staring
     AOR_LABEL:  IRS Step-and-Stare

 MOVING_TARGET:  YES
   TARGET_TYPE:  MOVING CLUSTER
   TARGET_NAME:  M_Comet
     EPHEMERIS:  NAIF_ID=1000025, NAIF_NAME=Encke
OBSERVE_OFFSETS_ONLY:  NO
 OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
       OFFSET1:  RA=10.0",    DEC=20.0"
       OFFSET2:  RA=20.0",    DEC=30.0"
       OFFSET3:  RA=-10.0",   DEC=-10.0"
       OFFSET4:  RA=-20.0",   DEC=-20.0"

          MODE:  STEP_AND_STARE
     LO_LONG14:  EXPOSURE_TIME=14,  N_CYCLES_SEQ=2,
STEP_PARALLEL=100.0, N_PARALLEL=5, STEP_PERPENDICULAR=100.0,
N_PERPENDICULAR=5, N_MAP_CYCLES = 1

RESOURCE_EST: TOTAL_DURATION=8502.9, EXPOSURE_TIME= 0.0 ,
SLEW_TIME=891.9, SETTLE_TIME=1275.0, SLEW_OVERHEAD=180,
UPLINK_VOLUME=0, DOWNLINK_VOLUME=0, VERSION=3.5 r. 1.31
```

```
      AOT_TYPE:  IRS Mapping
     AOR_LABEL:  IRS Spec Map

 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED SINGLE
   TARGET_NAME:  Test Target
  COORD_SYSTEM:  Equatorial  J2000
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
      POSITION:  RA=1h02m03.00s,  DEC=+4d05m06.0s

RESOURCE_EST: TOTAL_DURATION=2500.0, EXPOSURE_TIME= 0.0 ,
SLEW_TIME=0.0, SETTLE_TIME=0.0, SLEW_OVERHEAD=0, UPLINK_VOLUME=0,
DOWNLINK_VOLUME=0, VERSION=USER
COMMENT_START:
###   Peak-up Information
##        RA_OFFSET and DEC_OFFSET are in arcseconds
##        FLUX_DENSITY is in milliJanskys
#
# 1. Leave blank for default (no peak-up)
# 2. For IRS peak-up, edit this line and include it in the AOR
IRS_PEAK_UP:  OPTION=MODERATE, FILTER=BLUE, RA_OFFSET=5.0,
DEC_OFFSET=5.0, FLUX_DENSITY=1.0, EXTENDED=NO
# 3. For PCRS peak-up, edit this line and include it in the AOR
PCRS_PEAK_UP:  RA_OFFSET=5.0, DEC_OFFSET=5.0, FLUX_DENSITY=1.0
#
## Below the slits with parameters are listed. Only those desired
## for your observation should be included in the AOR.
#
HI_SHORT:  EXPOSURE_TIME=30, N_MAP_CYCLES=5, N_SCAN_LEGS=8,
SCAN_LEG_LENGTH=10, STEP_SIZE=1/2
HI_LONG:  EXPOSURE_TIME=60,  N__MAP_CYCLES=5, N_SCAN_LEGS=8,
SCAN_LEG_LENGTH=10, STEP_SIZE=1/2
LO_SHORT5:  EXPOSURE_TIME=6, N_MAP_CYCLES=2, N_SCAN_LEGS=4,
SCAN_LEG_LENGTH=4, STEP_SIZE=1/2
LO_SHORT7:  EXPOSURE_TIME=6, N__MAP_CYCLES=2, N_SCAN_LEGS=4,
SCAN_LEG_LENGTH=4, STEP_SIZE=1/2
LO_SHORT5_7:  EXPOSURE_TIME=6, N__MAP_CYCLES=2, N_SCAN_LEGS=4,
SCAN_LEG_LENGTH=4, STEP_SIZE=1/2
LO_LONG14:  EXPOSURE_TIME=14, N_MAP_CYCLES=1, N_SCAN_LEGS=4,
SCAN_LEG_LENGTH=4, STEP_SIZE=1/2
LO_LONG21:  EXPOSURE_TIME=14, N_MAP_CYCLES=1, N_SCAN_LEGS=4,
SCAN_LEG_LENGTH=4, STEP_SIZE=1/2
LO_LONG14_21:  EXPOSURE_TIME=14,  N_MAP_CYCLES=1, N_SCAN_LEGS=4,
SCAN_LEG_LENGTH=4, STEP_SIZE=1/2
#
###  SCAN_LEG_LENGTH is selected as integer multiples of the slit width
###  STEP_SIZE is selected as a fraction of  the slit length
###     (0, 1/4, 1/2, 3/4, full)
###  EXPOSURE TIME is in seconds, and must be selected from:
#
#    HI_LONG:  6, 14, 60, 240
#    HI_SHORT: 6, 30, 120, 480
#    LO_SHORT: 6, 14, 60, 240
#    LO_LONG:  6, 14, 30, 120

COMMENT_END:
```

```
      AOT_TYPE:  IRS Staring
     AOR_LABEL:  IRS no peak-up

 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED SINGLE
   TARGET_NAME:  A_Target_Ecliptic_2000
  COORD_SYSTEM:  Ecliptic  J2000
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
      POSITION:  RA=5.00000d,  DEC=+5.00000d

          MODE:  STANDARD
      HI_SHORT:  EXPOSURE_TIME=30,  N_CYCLES_SEQ=2
       HI_LONG:  EXPOSURE_TIME=60,  N_CYCLES_SEQ=3
     LO_SHORT5:  EXPOSURE_TIME=60,  N_CYCLES_SEQ=1
     LO_SHORT7:  EXPOSURE_TIME=60,  N_CYCLES_SEQ=1
     LO_LONG14:  EXPOSURE_TIME=14,  N_CYCLES_SEQ=1
     LO_LONG21:  EXPOSURE_TIME=14,  N_CYCLES_SEQ=1

RESOURCE_EST: TOTAL_DURATION=1434.0, EXPOSURE_TIME= 0.0 ,
SLEW_TIME=100.0, SETTLE_TIME=110.0, SLEW_OVERHEAD=180, UPLINK_VOLUME=0,
DOWNLINK_VOLUME=0, VERSION=3.5 r. 1.31
COMMENT_START:
Enter comments here.
COMMENT_END:


      AOT_TYPE:  IRS Staring
     AOR_LABEL:  IRS with PCRS peak-up

 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED CLUSTER - POSITIONS
   TARGET_NAME:  Cluster_Pos_2000
  COORD_SYSTEM:  Equatorial  J2000
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
     POSITION1:  RA=1h02m03.00s, DEC=+4d05m06.0s, PM_RA=3.0",
PM_DEC=4.0"
     POSITION2:  RA=1h02m15.00s, DEC=+4d01m03.0s, PM_RA=5.0",
PM_DEC=6.0"
     POSITION3:  RA=1h02m30.00s, DEC=+3d50m03.0s, PM_RA=2.0",
PM_DEC=1.0"

  PCRS_PEAK_UP:  RA_OFFSET=0.75",  DEC_OFFSET=5.5",  FLUX_DENSITY=1.2,
EXTENDED_SOURCE=NO
          MODE:  STANDARD
      HI_SHORT:  EXPOSURE_TIME=6,  N_CYCLES_SEQ=1
       HI_LONG:  EXPOSURE_TIME=60,  N_CYCLES_SEQ=1
     LO_SHORT5:  EXPOSURE_TIME=60,  N_CYCLES_SEQ=1
     LO_SHORT7:  EXPOSURE_TIME=60,  N_CYCLES_SEQ=1
     LO_LONG14:  EXPOSURE_TIME=30,  N_CYCLES_SEQ=2
     LO_LONG21:  EXPOSURE_TIME=30,  N_CYCLES_SEQ=2

RESOURCE_EST: TOTAL_DURATION=4617.5, EXPOSURE_TIME= 0.0 ,
SLEW_TIME=507.5, SETTLE_TIME=360.0, SLEW_OVERHEAD=180, UPLINK_VOLUME=0,
DOWNLINK_VOLUME=0, VERSION=3.5 r. 1.31
```

```
      AOT_TYPE:  IRS Staring
     AOR_LABEL:  IRS with peak-up

 MOVING_TARGET:  YES
   TARGET_TYPE:  MOVING SINGLE
   TARGET_NAME:  New TNO
     EPHEMERIS:  EPOCH=2451325.5, T=245013l.5, LITTLE_OMEGA=281.13,
BIG_OMEGA=78.84, ECCENTRICITY=0.3154067, PERIHELION-DISTANCE=8.1598,
INCLINATION-OF-ORBIT=5.96
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = NO

   IRS_PEAK_UP:  OPTION=MODERATE,  FILTER=BLUE,  RA_OFFSET=5.3",
DEC_OFFSET=20.2",  FLUX_DENSITY=2.3,  EXTENDED_SOURCE=NO
          MODE:  STANDARD
      HI_SHORT:  EXPOSURE_TIME=6,  N_CYCLES_SEQ=1
       HI_LONG:  EXPOSURE_TIME=60,  N_CYCLES_SEQ=1
     LO_SHORT5:  EXPOSURE_TIME=60,  N_CYCLES_SEQ=1
     LO_SHORT7:  EXPOSURE_TIME=60,  N_CYCLES_SEQ=1
     LO_LONG14:  EXPOSURE_TIME=14,  N_CYCLES_SEQ=1
     LO_LONG21:  EXPOSURE_TIME=14,  N_CYCLES_SEQ=1

RESOURCE_EST: TOTAL_DURATION=1287.0, EXPOSURE_TIME= 0.0 ,
SLEW_TIME=162.0, SETTLE_TIME=155.0, SLEW_OVERHEAD=180, UPLINK_VOLUME=0,
DOWNLINK_VOLUME=0, VERSION=3.5 r. 1.31
COMMENT_START:
Enter comments here.
COMMENT_END:



      AOT_TYPE:  MIPS Photometry
     AOR_LABEL:  MIPS PH/SR

 MOVING_TARGET:  YES
   TARGET_TYPE:  MOVING SINGLE
   TARGET_NAME:  M_Vesta
     EPHEMERIS:  NAIF_ID=2000004, NAIF_NAME=Vesta
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = NO

    MICRON_24: DITHER_SIZE = SMALL, EXPOSURE_TIME = 3, SKY_OFFSET =
300.0, N_CYCLES = 2
    MICRON_70: IMAGE_SCALE = DEFAULT, DITHER_SIZE = SMALL,
EXPOSURE_TIME = 10, N_CYCLES = 3
   MICRON_160: DITHER_SIZE = SMALL, EXPOSURE_TIME = 10, N_CYCLES = 4
RESOURCE_EST: TOTAL_DURATION=1473.6826, EXPOSURE_TIME= 0.0 ,
SLEW_TIME=96.3, SETTLE_TIME=62.3826, SLEW_OVERHEAD=180,
UPLINK_VOLUME=864, DOWNLINK_VOLUME=24852176, VERSION=3.5 r. 1.31
COMMENT_START:
Enter comments here.


COMMENT_END:
```

```
      AOT_TYPE:  MIPS Photometry
     AOR_LABEL:  MIPS PH/SR Raster

 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED SINGLE
   TARGET_NAME:  A_Target_Ecliptic_1950
  COORD_SYSTEM:  Ecliptic  B1950
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
      POSITION:  RA=17.20000d,  DEC=+35.60000d, EPOCH=1950.0

    MICRON_24: DITHER_SIZE = SMALL, EXPOSURE_TIME = 3, SKY_OFFSET =
300.0, N_CYCLES = 1
 MICRON24_MAP: ROWS=3, COLS=3, ROW_STEP=1, COL_STEP=1, N_MAP_CYCLES=1
    MICRON_70: IMAGE_SCALE = DEFAULT, DITHER_SIZE = SMALL,
EXPOSURE_TIME = 10, N_CYCLES = 1
 MICRON70_MAP: ROWS=3, COLS=3, ROW_STEP=1/2, COL_STEP=1/2,
N_MAP_CYCLES=1
   MICRON_160: DITHER_SIZE = SMALL, EXPOSURE_TIME = 10, N_CYCLES = 1
MICRON160_MAP: ROWS=3, COLS=3, ROW_STEP=1/2, COL_STEP=1/2,
N_MAP_CYCLES=1
RESOURCE_EST: TOTAL_DURATION=4721.128, EXPOSURE_TIME= 0.0 ,
SLEW_TIME=529.9, SETTLE_TIME=255.22795, SLEW_OVERHEAD=180,
UPLINK_VOLUME=4704, DOWNLINK_VOLUME=79518816, VERSION=3.5 r. 1.31
COMMENT_START:
Enter comments here.


COMMENT_END:




      AOT_TYPE:  MIPS SED
     AOR_LABEL:  MIPS SED

 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED SINGLE
   TARGET_NAME:  Test Target
  COORD_SYSTEM:  Equatorial  J2000
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
      POSITION:  RA=1h02m03.00s,  DEC=+4d05m06.0s

SED:  EXPOSURE_TIME = 3, CHOP_DISTANCE = +1, N_CYCLES = 1
SED_MAP:  COLS = 3, ROWS = 3, COL_STEP = 1, ROW_STEP = 1/2
RESOURCE_EST: TOTAL_DURATION=1500.0, EXPOSURE_TIME= 0.0 ,
SLEW_TIME=0.0, SETTLE_TIME=0.0, SLEW_OVERHEAD=0, UPLINK_VOLUME=0,
DOWNLINK_VOLUME=0, VERSION=USER
```

```
      AOT_TYPE:  MIPS Scan Map
     AOR_LABEL:  MIPS Scan

 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED SINGLE
   TARGET_NAME:  A_Target_2000
  COORD_SYSTEM:  Equatorial  J2000
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
      POSITION:  RA=12h07m00.00s,  DEC=-5d05m00.0s, PM_RA=3.5",
PM_DEC=4.21"

    REQUIRE_160: YES
      SCAN_RATE: medium
 FAST_RESET_160: NO
      STEP_SIZE: TURNAROUND=35", FORWARD=35"
    N_SCAN_LEGS: 6
   N_MAP_CYCLES: 1
SCAN_LEG_LENGTH: 2.5

RESOURCE_EST: TOTAL_DURATION=9957.538, EXPOSURE_TIME= 0.0 ,
SLEW_TIME=123.2, SETTLE_TIME=39.338463, SLEW_OVERHEAD=180,
UPLINK_VOLUME=768, DOWNLINK_VOLUME=278340432, VERSION=3.5 r. 1.31
COMMENT_START:
Enter comments here.


COMMENT_END:




      AOT_TYPE:  MIPS Total Power
     AOR_LABEL:  MIPS Total Power

 MOVING_TARGET:  NO
   TARGET_TYPE:  FIXED SINGLE
   TARGET_NAME:  Test Target
  COORD_SYSTEM:  Equatorial  J2000
OBJECT_AVOIDANCE:  EARTH = YES, OTHERS = YES
      POSITION:  RA=1h02m03.00s,  DEC=+4d05m06.0s

    MICRON_24:  EXPOSURE_TIME = 10, N_CYCLES = 5
    MICRON_70:  EXPOSURE_TIME = 10, N_CYCLES = 5
    MICRON_160:  EXPOSURE_TIME = 10, N_CYCLES = 5
RESOURCE_EST: TOTAL_DURATION=500.0, EXPOSURE_TIME= 0.0 , SLEW_TIME=0.0,
SETTLE_TIME=0.0, SLEW_OVERHEAD=0, UPLINK_VOLUME=0, DOWNLINK_VOLUME=0,
VERSION=USER
```